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Subject: ACIS Spatial Contamination File and Tests
Date: 05 November 2004

ACIS Spatial Contamination Tests

We have implemented the current model for ACIS spatial contamination as a function of energy, time, and detector location as a Chandra calibration database FITS file with interfaces in the analysis reference data library ("ardlib"). The file and functional for are defined in the ARD Interface Control Document [1]. Here we show the results of tests using the new file in the CIAO 3.2 ardlib tools (`mkgarf, mkarf, mkinstmap`).

[1] `http://space.mit.edu/ASC/docs/ARD_ICD/ARD_ICD-v1.7_contamxy.ps.gz`

Grating Response/ACIS-S

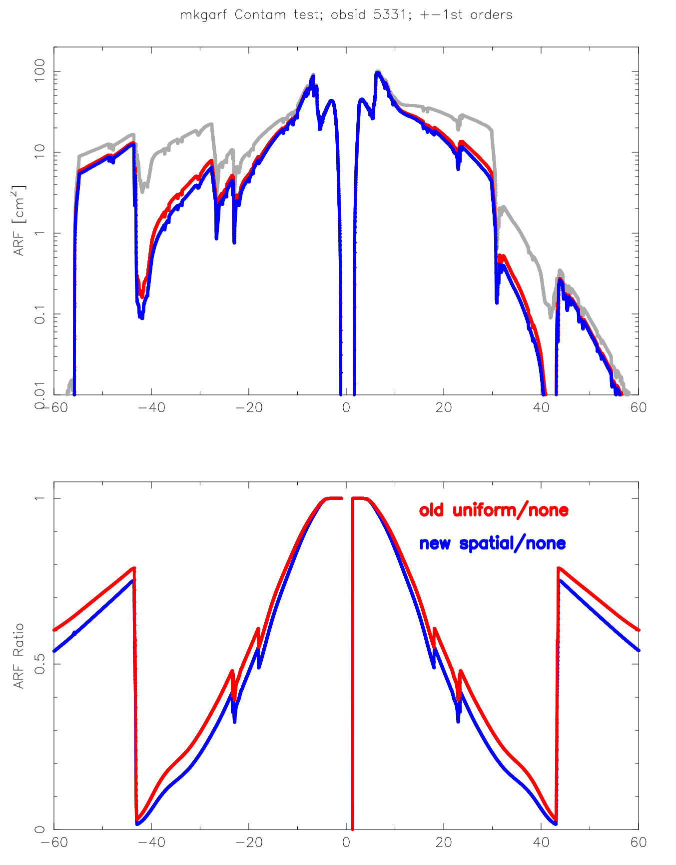

Figure 1: This shows the effective area function and ratios for the observation of Markarian 421 made with LETG/ACIS-S on July 12, 2004 (ObsID 5331). The top panel shows the effective areas for no contamination (grey; highest curve), the uniform spatial model (red; middle curve), and the new spatially dependent model (blue; lowest curve). The lower panel shows the ratios of each of the old and the new models to the uncontaminated response (red and blue, respectively). The x coordinate is $m\lambda$, and only ± 1 orders are shown. This test was used for verification by the Calibration Group. It include bad pixels and dither.

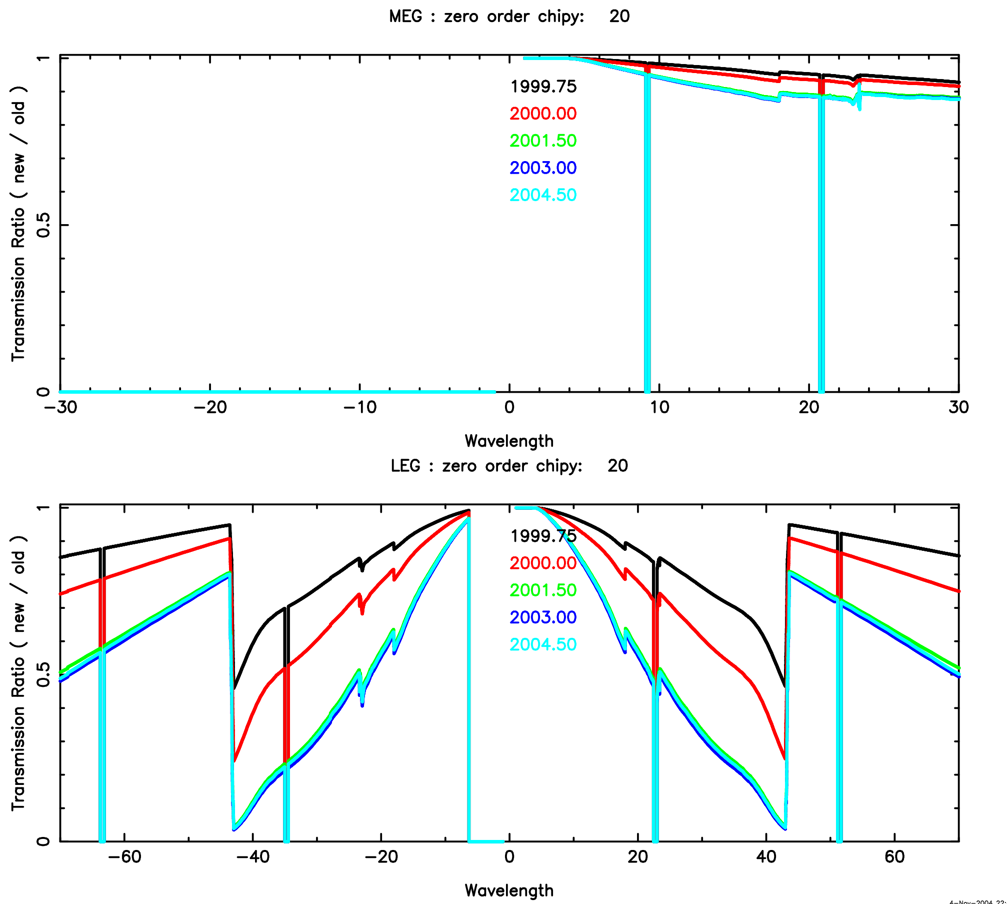

Figure 2: This, and the following figures, show the ratio of the new model to the uniform model at different times and different zero order source positions along `CHIPY`, in which the spatial component varies on ACIS-S. In each plot, the top panel shows MEG −1 and +1 orders, and the bottom shows LETG/ACIS-S, −1 and +1 orders. Curves from top to bottom are at different epochs (though the latest three largely overlap). The approximate `CHIPY` is given in the plot title. No dither was included in these computations, so the chip gaps show as sharp discontinuities. Since the MEG spectrum traverses a large range in `CHIPY`, the MEG response is asymmetric with order (the −1 order falls off the ACIS-S array at the lowest `CHIPY`).

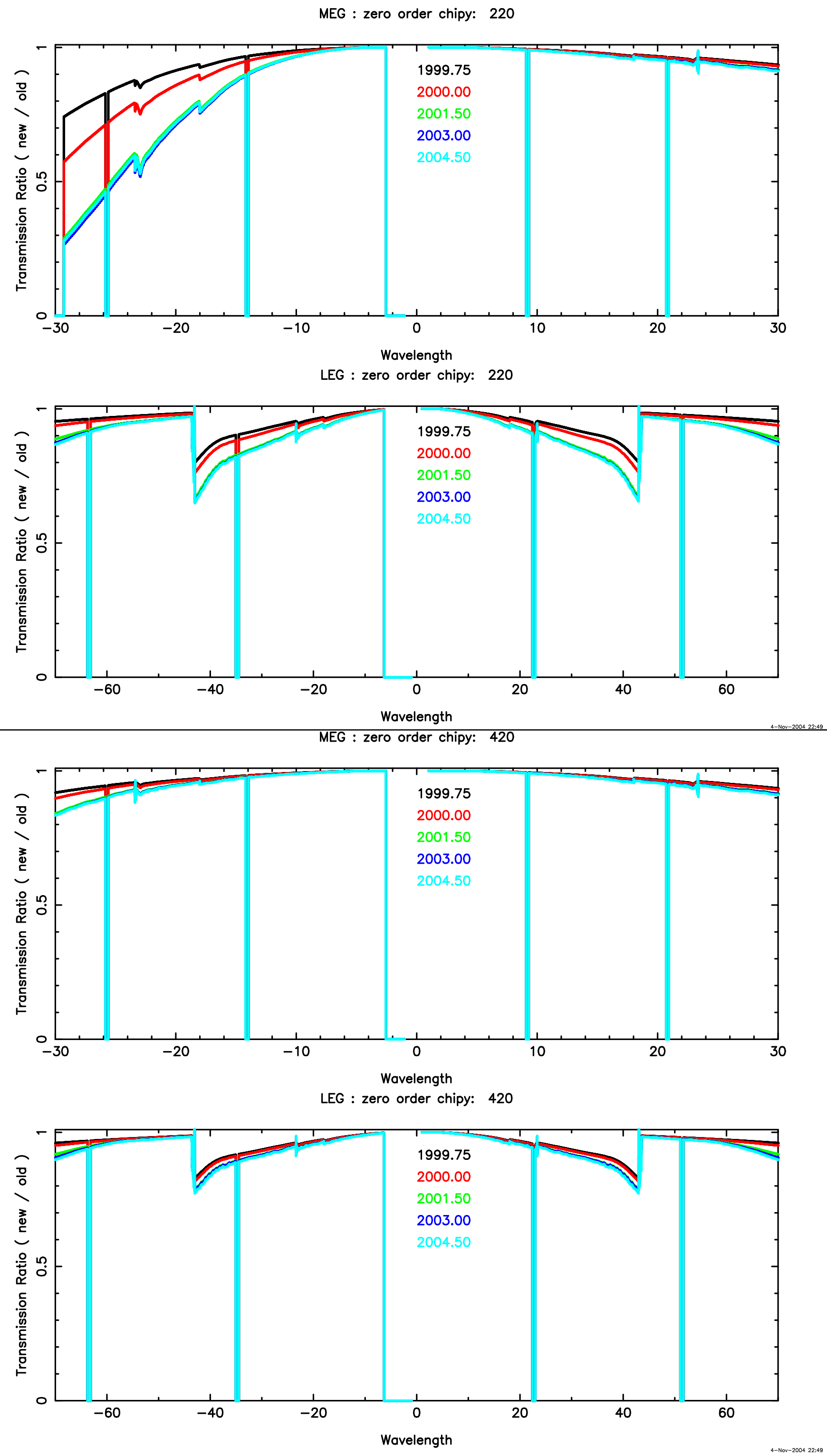

Figure 3: See Figure 2 caption.

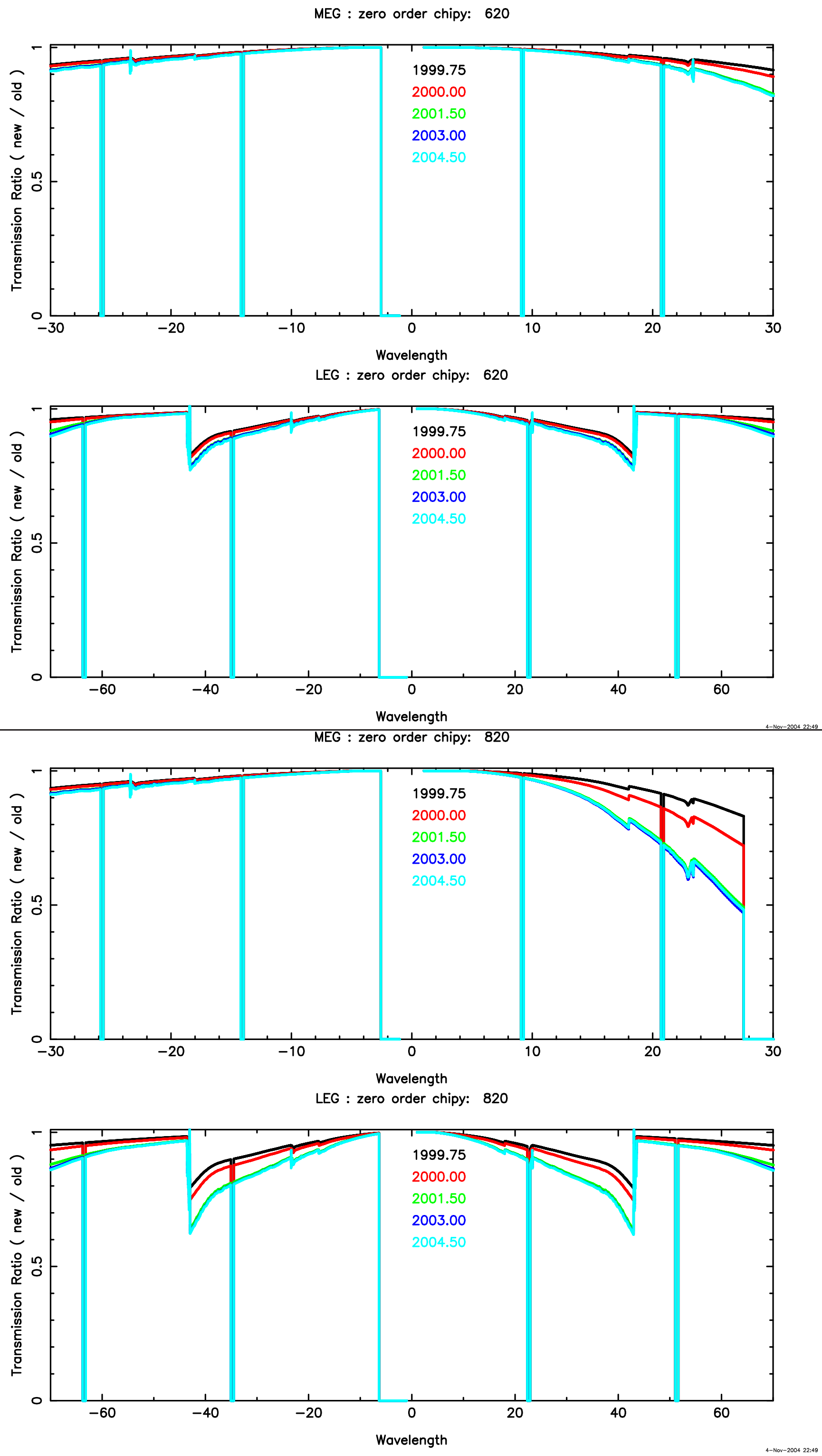

Figure 4: See Figure 2 caption.

Imaging Response/ACIS-I

Figure 5: The ACIS-2 (I2) instrument map at 1 keV for contamination only (mirror area= 1, $QE = 1$) in mid-2004. The transmission in the upper right is 0.8, and at the lower left is 0.6.

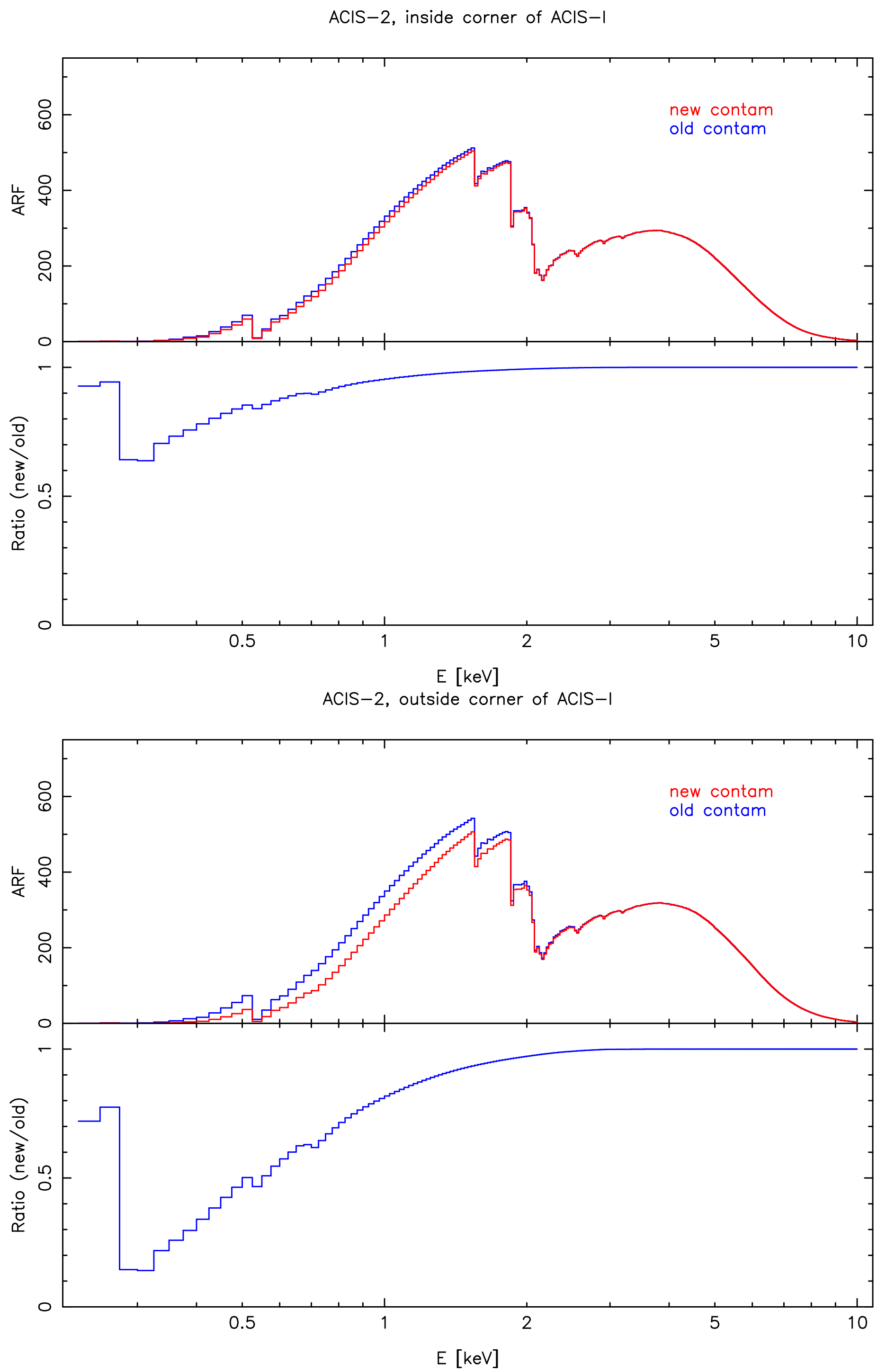

Figure 6: The ACIS-2 (I2) effective area in mid-2004 for the spatial and uniform contamination models near the ACIS-I center (top), and near the edge (bottom). In each plot, the top panel is the effective area, and the bottom the ratio of the new (spatially dependent) to old (uniform) contamination models.

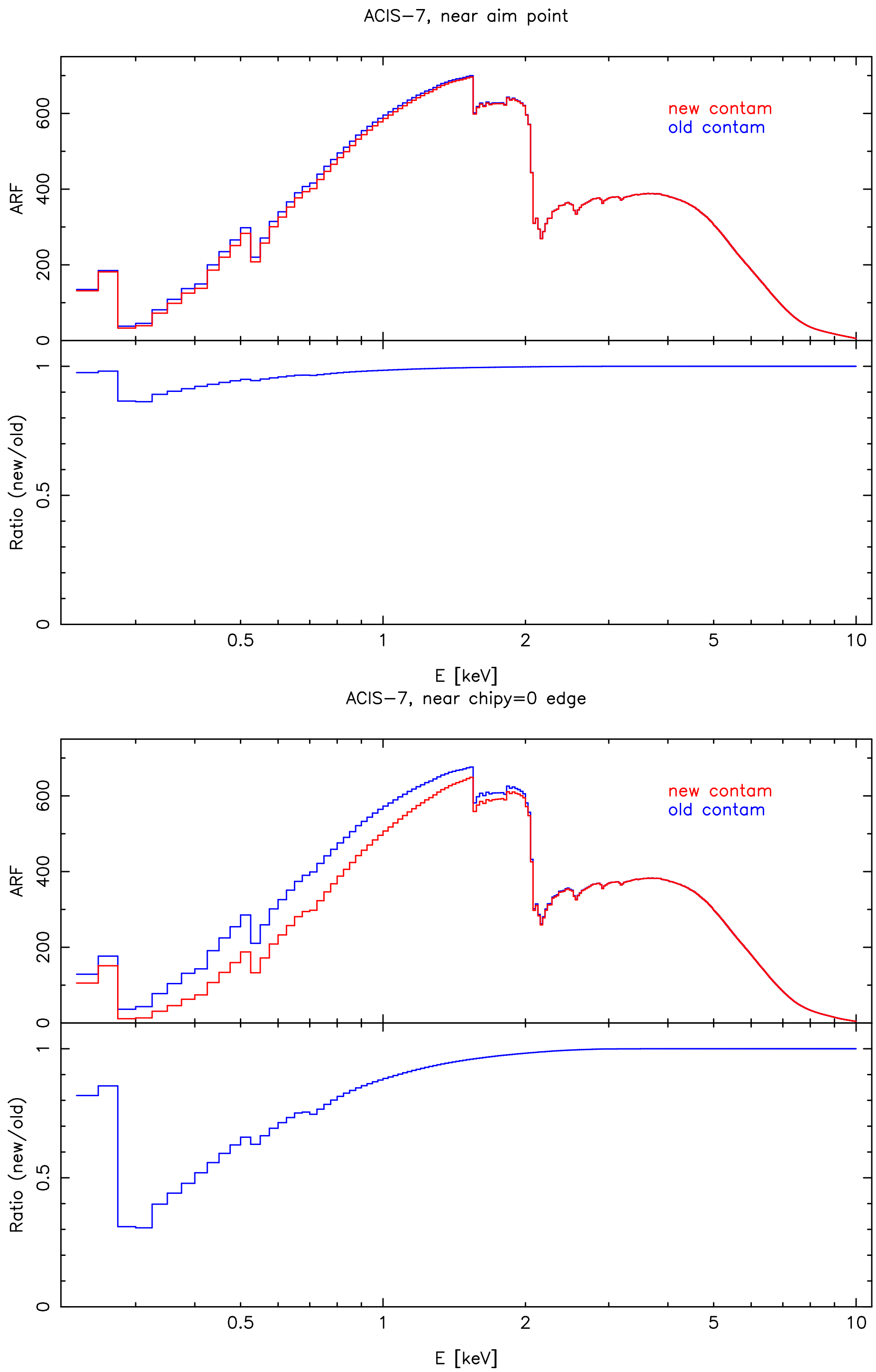

Figure 7: The ACIS-7 (S3) effective area in mid-2004 for the spatial and uniform contamination models. Top plot is the response evaluated near the aim point of S3 on the ACIS-S array, and the lower plot is near the edge. In each plot, the upper panel is the effective area, and the lower is the ratio of new spatially dependent model to the old uniform model.