

FINAL SUMMARY REPORT

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The Nature of the Flaring EUVE Companion to HD 43162

Cycle 3 XMM-Newton Observations

Summary – The purpose of our program was to observe and characterize the companion to HD 43162, EUVE J0614–2354, which (serendipitously) experienced an enormous flare event during our EUVE observation of HD 43162, one of the nearby solar analogs that we observed during our survey of this population.

Our observation was carried out and the data have been received and reduced. We are able to identify EUVE J0614–2354 in both the X-ray (EPIC MOS + PN) and the UV (OM) data, which provides a sub-arcsecond position for this source. Our findings are consistent with the analysis of Christian et al. (2003a,b), who identify EUVE J0614–2354 with a coronally-active M-dwarf star at distance $d = 15 \pm 5$ pc. The X-ray spectrum from the EPIC data are also consistent with this identification.

Analysis – In Figure 1 we present the XMM X-ray (EPIC) and UV (OM) images of HD 43162 and EUVE J0614–2354. Within the EUVE localization region for EUVE J0614–2354, we identify a single bright X-ray source which we identify as the counterpart. This object is visible as well in all of the UV bands used in our OM sequence; the subarcsecond localization from the OM imaging confirms the proposed association of Christian et al. (2003a,b). We note that the Christian et al. publications appeared during the interval between submission of our *XMM* proposal and our receipt of the data.

As a result of the Christian et al. observations, and our own confirmation via XMM, the flaring source EUVE J0614–2354 is revealed to be an M-dwarf (spectral type dM3.5e). The flare it exhibited during our EUVE observations, a $\gtrsim 100$ -fold increase in flux over the persistent emission, thus had an energy $E \sim 3 \times 10^{34}$ ergs, as energetic as the largest EUV flare previously seen (Cully et al. 1993). Spectral analysis of the EUVE data confirm its coronal origins, and a compact object origin for the flare is definitively excluded.

References

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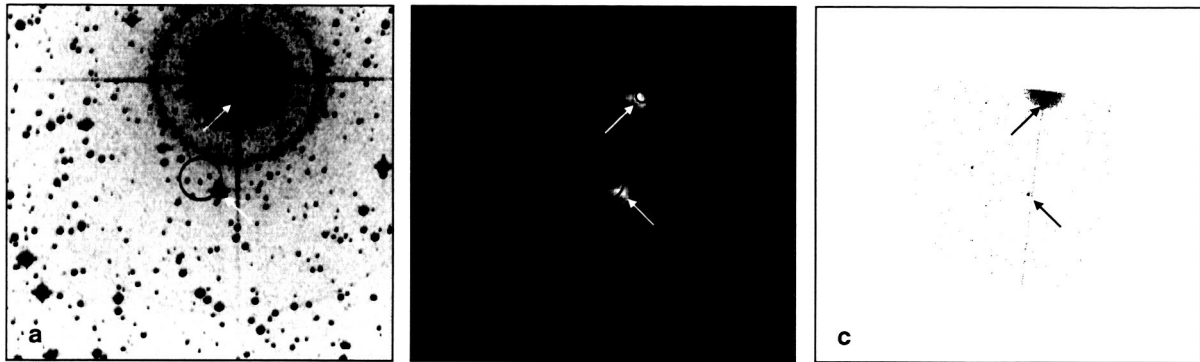


Fig. 1.— XMM identification of the X-ray and optical counterpart to the flaring source EUVE J0614–2354. On the left (a) we show the Digitized Sky Survey (XDSS) image of the region surrounding HD 43162 and EUVE J0614–2354. The 0.5′-radius EUVE localization for EUVE J0614–2354 is shown as the blue circle; a red circle shows the location of the ROSAT All-Sky Survey source 1RXSJ061345.1–235205. The white arrows indicate the counterparts to these sources proposed by Christian et al. (2003a,b). In the center (b) we show the XMM EPIC (MOS) image of this region. A single bright X-ray source can be associated with EUVE J0614–2354; this source is coincident with the dM3.5e star of Christian et al. (2003a,b). In addition the association of the dM4.0e star and 1RXSJ061345.1–235205 seems quite probable; note however that the brightness of HD 43162 and 1RXSJ061345.1–235205 results in photon pileup in this region of the chip. On the right (c) we show an XMM OM (UVM2) image of this region; the association of the XMM X-ray source with the dM3.5e star is confirmed to sub-arcsecond precision.