XMM-Newton Observations of Two Soft X-Ray Selected Magnetic CVs

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With the X-ray satellite XMM-Newton, we have obtained 20 ksec exposures of the AM Her type systems AI Tri and QS Tel, simultaneously measured by the EPIC instruments in the X-ray regime between 0.1 and 10 keV and by the Optical Monitor in the ultraviolet UVM2 filter. Additional optical photometry has been performed at several sites during their high states of accretion.

The long-period system AI Tri has been monitored for the first time over a whole orbital cycle in X-rays. The light curve is dominated by highly variable soft X-ray emission over about 70% of the binary orbit, in addition to a weak hard component visible nearly all the time. The associated spectral model is composed of a mildly absorbed blackbody with $kT_{\rm bb} = 35.8^{+1.5}_{-1.5}$ eV and $N_{\rm H} = 3.66^{+0.43}_{-0.47} \cdot 10^{20}{\rm cm}^{-2}$, and MEKAL plasma emission with a mean temperature of $13.5^{+5.4}_{-2.5}$ keV. Phase-resolved spectral modeling supports the picture of a one-pole accreting system which undergoes a self-eclipse of the accretion region.

The shape of the complex X-ray light curve of QS Tel, supposed to change between states of one-pole and two-pole accretion, suggests a single active pole at the time of observation. Its soft X-ray governed bright phase with a double-peaked maximum covers less than half the orbital period and is disrupted by a deep narrow dip in the soft X-ray emission. The hard spectrum of the accretion stream can be described by a multi-component MEKAL model at relatively low temperatures between 0.1 and 5 keV. The soft blackbody component, reflecting the spectral contribution of the white dwarf primary, shows almost no hydrogen absorption ($N_{\rm H} \leq 2.5 \cdot 10^{19}{\rm cm}^{-2}$) and is with $kT_{\rm bb} = 25.2^{+1.0}_{-2.6}$ eV slightly cooler than in AI Tri.

Evident discrepandies between observed X-ray spectrum and blackbody approximation emphasize the need for accurate models including radiative transfer to reproduce the White Dwarf's contribution in a more realistic way.