A search of planet companions of white dwarfs with *XMM-Newton*

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We use all avalible *XMM-Newton* EPIC observations of putative single white dwarfs (WD) to search for sub-stellar companions, in particular, planets. We gathered more than 2 Ms of observations of 116 WD to study their variability in the hard X-rays. We found al least four cases of WD with variable X-ray emission that can be explained by a pressence of a Jupiter like planet. Here we pressent our ressults regarding WD 0121-756.

Chu et al. (2021) demonstrated that WD 0121-756 exhibits hard X-ray emmision. The star itself is not able to produce X-rays with energies larger that 0.5 keV.

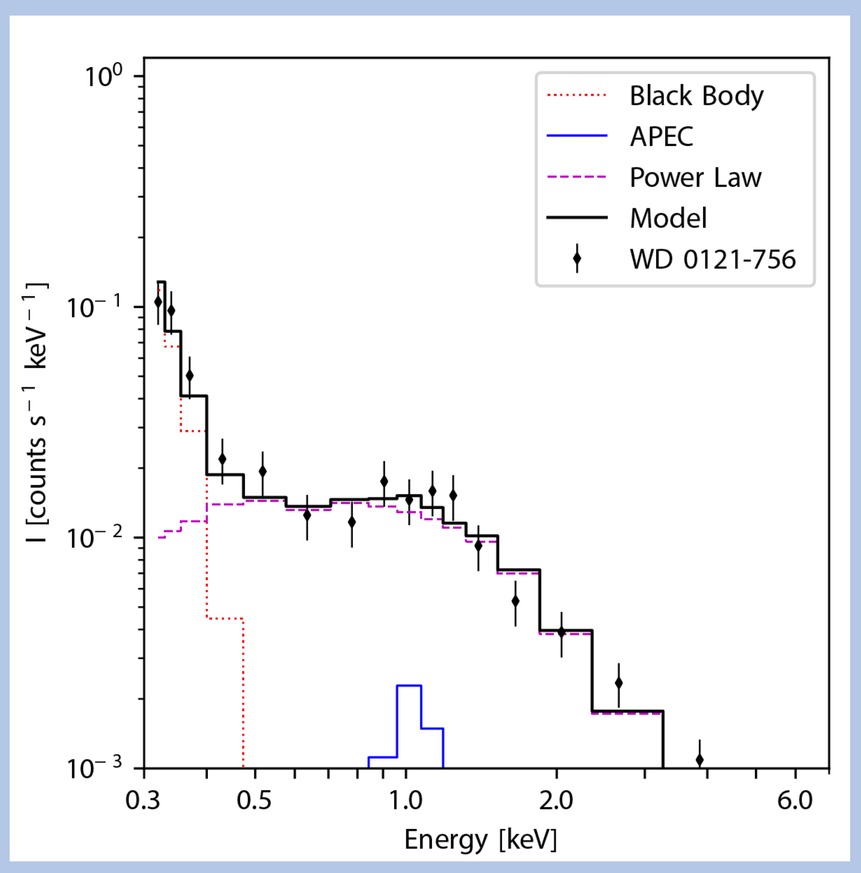

Fig. 1: EPIC (pn+MOS1+MOS2) spectrum of WD 0121-756. Different components are shown in different colors.

We explore the variability of the hard X-ray emission (E>0.6 keV) and found a period of 8.32 ks.

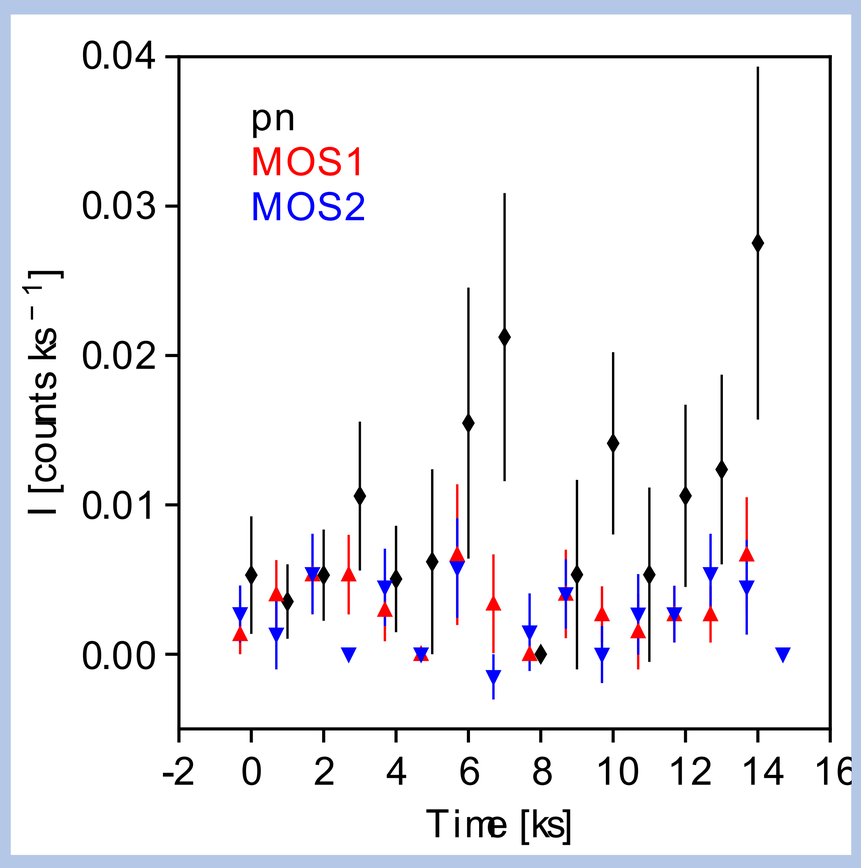

Fig. 2: EPIC lightcurves of WD 0121-756.

The IR photometry of WD 0121-756 rules out the pressence of a stellar companion down to a star of M8 V type. The IR SED can be modeled by a black body, with T_{eff} = 180 kK, similar as that estimated for this WD, for $\lambda < 10$ µm.

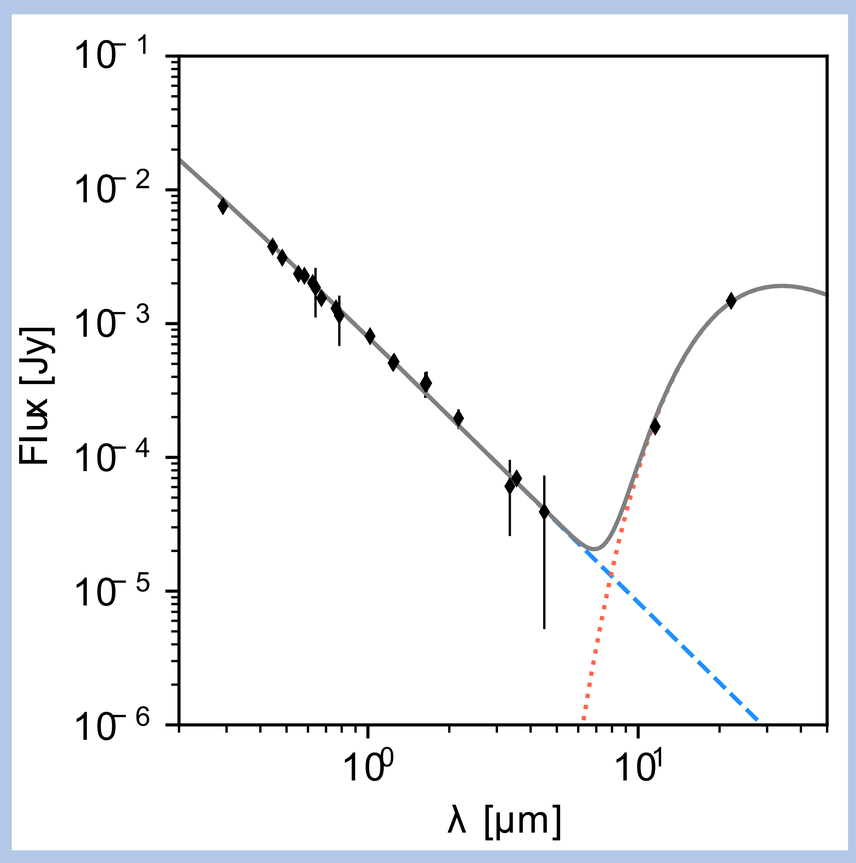

Fig. 3: IR SED of WD 0121-756. Black diamonds represent observations. The (blue) dash and (orange) dotted lines show the contribution from the WD and the best fit to a dust-rich disk component. The model was achieved with the photoionization code Cloudy (Ferland et al. 2017).

We explore different sub-stellar candidates that could explain the X-ray variability. We found that a Jupiter-like planet can easily fill its Roche lobe to produce the observed X-ray emission.
Finally, the IR SED suggest the pressence of a disk surrounding this WD (Bilikova et al. 2012). Thus, we are witnessing the destruction of a planetary system surrounding WD 0121-756.

References:
Chu, Y.-H., et al., 2021, ApJ, 910, 119.
Bilikova, J., et al., 2012, ApJS, 200, 3.
Ferland, G. J., et al., 2017, RMxAA, 53, 385.