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Spectral Analysis of ULXs in Pairs of Interacting Galaxies M51 and NGC 4485/90 Using Swift-XRT

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In this study, we report the examinations of the spectra of ULXs in two nearby (< 10 Mpc) pairs of interacting galaxies M51 and NGC 4485/90 collected by Swift-XRT observations from 2005 to 2014 and 2008 to 2015 for each target, respectively. We consider 9 ULXs in M51 and 5 ULXs in NGC 4485/90. We obtain 116 ObsIDs of M51 and 37 ObsIDs of NGC 4485/90. For each pair of interacting galaxy, there are about 10% data that do not meet our criteria for further analysis.

The count rate of individual observation ranges from 0.00003 to 0.05 counts/s in 0.3 - 10 keV band with typical errorbar ˜ 30%. Some ULXs in M51 exhibit a considerable fluctuation of intensity, up to three times, from 0.01 counts/s to 0.03 counts/s. ULXs in NGC 4485/90 show more stable light curves with no significant changes in intensity. For every source, we divide the data into two categories, e.g. hard-state (those with hardness ratio ≥ 1) and soft-state (those with hardness ratio < 1). Due to the short exposure time during the observation, we got low S/N data with wide errorbar. Therefore, we combine spectrum from many observations with similar spectral characteristics for fitting purpose. We fit the co-added spectra with commonly used models: disk blackbody, power law, and the combination of several models.

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