RBS 1774: A New Isolated Neutron Star Candidate

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Abstract

Over the last years ROSAT observations led to the discovery of six very soft X-ray sources with quite peculiar characteristics. Among these are (i) blackbody-like spectrum with $T \sim 100$ eV; (ii) exceedingly large X-ray to optical flux ratio, $f_X/f_V > 10^3$; (iii) low X-ray luminosity, $L_X \approx 10^{30} - 10^{31} \mathrm{erg\,s^{-1}}$; (iv) low column density, $N_H \sim 10^{20}$ cm^{-2}; (v) no evidence for a binary companion; (vi) absence of large flux variations on timescales from months to years. All these points, in particular the extreme values of f_X/f_V together with the small distances implied by the low column density, qualify these sources as potential, close-by Isolated Neutron Stars (INSs). Three sources have been found to pulsate with periods in the range 5-23 s, strengthening further the association with neutron stars. The discovery of new INS candidates is of paramount importance to shed light on the properties of these sources and to constrain their distribution in the Galaxy. We report the identification of a new possible INS candidate in archival ROSAT observations. The source, RBS 1774, is very soft, exhibits a thermal spectrum well fitted by a blackbody at $T \sim 90$ eV and has low column density, $N_H \sim 4 \times 10^{20}$ cm^{-2}. No plausible optical counterpart was found on DSS2 blue and red plates to a limiting magnitude ~ 22, implying a X-ray to optical flux ratio ≈ 100. Catalogue searches revealed no known sources in other energy bands within the X-ray error box of RBS 1774. Follow-up optical observations with NTT show no peculiar object close to the X-ray source position down to a magnitude $m_R \sim 24$. Comparison with a previous RASS observation do not show variability on a timescale of months. All these points are at the basis of our claim that RBS 1774 is the seventh isolated neutron star discovered so far.

CATEGORY: SUPERNOVAE, SUPERNOVA REMNANTS AND ISOLATED NEUTRON STARS