High-energy x-rays from j174545.5-285829, the cannonball: a candidate pulsar wind nebula associated with Sgr a east

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Abstract

We report the unambiguous detection of non-thermal X-ray emission up to 30 keV from the Cannonball, a few-arcsecond long diffuse X-ray feature near the Galactic Center, using the NuSTAR X-ray observatory. The Cannonball is a high-velocity (v proj ~ 500 km s–1) pulsar candidate with a cometary pulsar wind nebula (PWN) located ~2' north-east from Sgr A*, just outside the radio shell of the supernova remnant Sagittarius A (Sgr A) East. Its non-thermal X-ray spectrum, measured up to 30 keV, is well characterized by a Γ ~ 1.6 power law, typical of a PWN, and has an X-ray luminosity of L(3-30 keV) = 1.3 × 1034 erg s–1. The spectral and spatial results derived from X-ray and radio data strongly suggest a runaway neutron star born in the Sgr A East supernova event. We do not find any pulsed signal from the Cannonball. The NuSTAR observations allow us to deduce the PWN magnetic field and show that it is consistent with the lower limit obtained from radio observations..

Keywords

Galaxy, center, ISM, individual objects (Sagittarius A, Sagittarius A East), ISM, supernova remnants, stars, neutron, Xrays, individual (Cannonball).