Confirming the nature of the knot near pulsar B1951+32

D. A. Zyuzin[1*], Yu. A. Shibanov[1†], G. G. Pavlov[2], A. A. Danilenko[1]

[1]Ioffe Institute, Russia

[2]Pennsylvania State University, USA

The middle-aged, energetic and fast moving radio and gamma-ray pulsar PSR B1951+32 is associated with supernova remnant CTB 80. It powers a complex pulsar wind nebula detected in the radio, H-alpha and X-rays [1]. A puzzling optical knot was detected about 0.″5 from the pulsar in the optical and near-IR [1, 2]. It is reminiscent of the unique "inner optical knot" located 0.″6 from the Crab pulsar. Until now there was no evidence that B1951+32 knot is indeed associated with the pulsar.

We observed the pulsar field with Gemini-North in 2016 yr to confirm the association. We performed first near-IR high-spatial resolution imaging in the K_s band using the NIRI+Altair instrument and deep optical imaging in the *gr* bands using the GMOS instrument. Our observations showed that the current knot position is shifted by $\approx$0.″5 from the position measured with the HST (1997 epoch). This is consistent with the known pulsar proper motion and is a direct evidence of the pulsar–knot connection. We established the spectral energy distribution (SED) of the knot and compared with the SED of the Crab knot. We discuss possible implications of the results.

References

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*E-mail: da.zyuzin@gmail.com

†E-mail: shib@astro.ioffe.ru