

REVEALING THE NATURE OF THE HIGHLY OBSCURED GALACTIC SOURCE IGR J16318–4848⁰

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RESUMEN

El resumen será traducido al español por los editores. The X-ray source IGR J16318–4848 was the first source discovered by INTEGRAL on 2003, January 29. We carried out optical and near-infrared (NIR) observations at the European Southern Observatory (ESO La Silla) in the course of a Target of Opportunity (ToO) programme. We discovered the optical counterpart and confirmed an already proposed NIR candidate. NIR spectroscopy revealed a large amount of emission lines, including forbidden iron lines and P-Cygni profiles. The spectral energy distribution of the source points towards a high luminosity and a high temperature, with an absorption greater than the interstellar absorption, but two orders of magnitude lower than the X-ray absorption. We show that the source is an High Mass X-ray binary (HMXB) at a distance between ~ 1 and ~ 6 kpc, the mass donor being an early-type star, probably a sgB[e] star, surrounded by a rich and absorbing circumstellar material. This would make the second High Mass X-ray Binary (HMXB) with a sgB[e] star after CI Cam, indicating that a new class of strongly absorbed X-ray binaries is being unveiled by INTEGRAL.

ABSTRACT

The X-ray source IGR J16318–4848 was the first source discovered by INTEGRAL on 2003, January 29. We carried out optical and near-infrared (NIR) observations at the European Southern Observatory (ESO La Silla) in the course of a Target of Opportunity (ToO) programme. We discovered the optical counterpart and confirmed an already proposed NIR candidate. NIR spectroscopy revealed a large amount of emission lines, including forbidden iron lines and P-Cygni profiles. The spectral energy distribution of the source points towards a high luminosity and a high temperature, with an absorption greater than the interstellar absorption, but two orders of magnitude lower than the X-ray absorption. We show that the source is an High Mass X-ray binary (HMXB) at a distance between ~ 1 and ~ 6 kpc, the mass donor being an early-type star, probably a sgB[e] star, surrounded by a rich and absorbing circumstellar material. This would make the second High Mass X-ray Binary (HMXB) with a sgB[e] star after CI Cam, indicating that a new class of strongly absorbed X-ray binaries is being unveiled by INTEGRAL.

Key Words: STARS: CIRCUMSTELLAR MATTER — STARS: EMISSION-LINE — BE—X-RAYS: BINARIES — IGR J16318-4848

IGR J16318–4848 has been the first source to be discovered by the INTEGRAL imager IBIS/ISGRI on 2003 January 29, 0.5° south from the galactic equator (Courvoisier et al. 2003). A subsequent observation by XMM-Newton on 2003 February 10 localized it with an accuracy of $4''$, the high energy spectrum suggesting a high column density of $N_{\text{H}} > 10^{24} \text{ cm}^{-2}$ (Matt & Guainazzi (2003), Walter et al. (2003)). In the course of a ToO programme at ESO to look for counterparts of high energy sources discovered by satellites including IN-

TEGRAL (PI S. Chaty), we carried out on 2003, February, 23-25 photometric and spectroscopic observations in the optical and NIR of the high-energy source IGR J16318–4848, with EMMI and SOFI instruments on ESO/NTT. We discovered the optical counterpart and confirmed the NIR one (see Walter et al. (2003)) by independent astrometry. The optical/NIR images and spectra are shown in Figures 1, 2, 3, 4 and 5. We derived the absorption along the line of sight: $A_{\text{v}} \sim 17.4$ magnitudes, and the temperature of the companion star: ~ 18000 K. The distance of the source is constrained between ~ 1 and ~ 6 kpc. The $0.95 - 2.52 \mu\text{m}$ NIR spectrum is highly unusual, very rich in emission lines, suggesting a highly complex and stratified circumstellar environment, or an envelope. Study of the spectral lines suggest a sgB[e] star so the system would be

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⁰Based on observations collected at the European Southern Observatory, Chile (observing proposal ESO N° 70.D-0340).

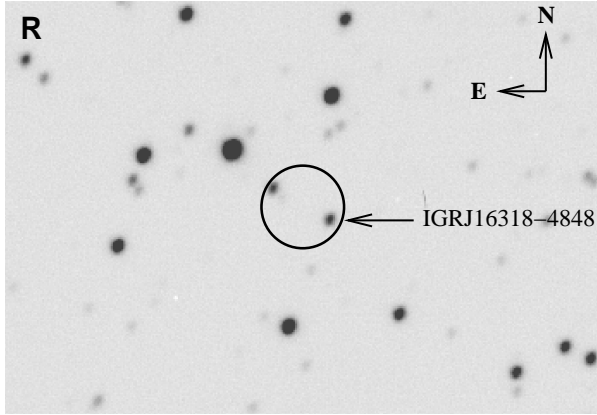


Fig. 1. R band image of the field of view of IGR J16318–4848. We reported the XMM uncertainty circle of $4''$.

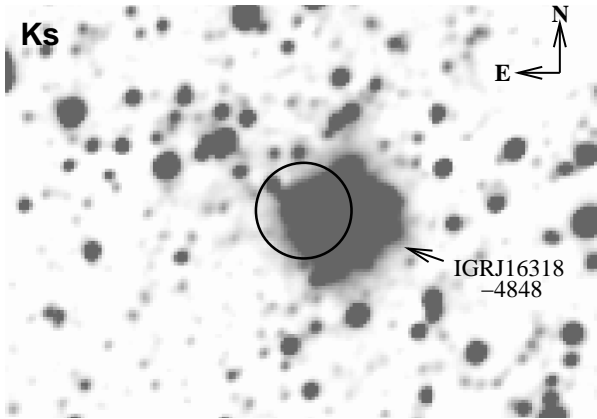


Fig. 2. Ks band image of the same field.

a HMXB, probably hosting a neutron star, like CI Cam. The reader should consult Filliatre & Chaty (2004) for more details. INTEGRAL is on the course of revealing a new population of obscured high energy sources, which might help us to understand the evolution of high-energy binary systems.

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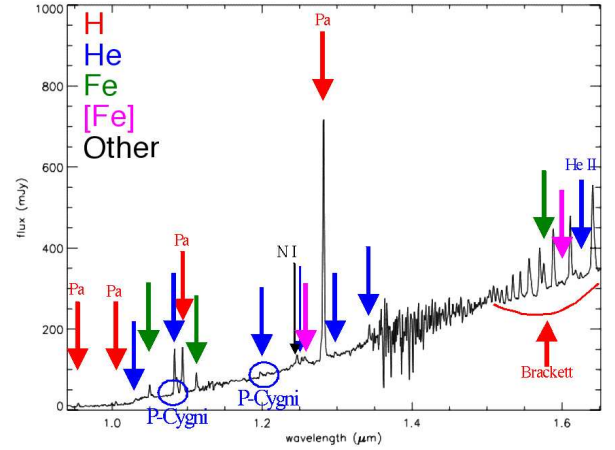


Fig. 3. NIR spectrum (0.95–1.65 μm)

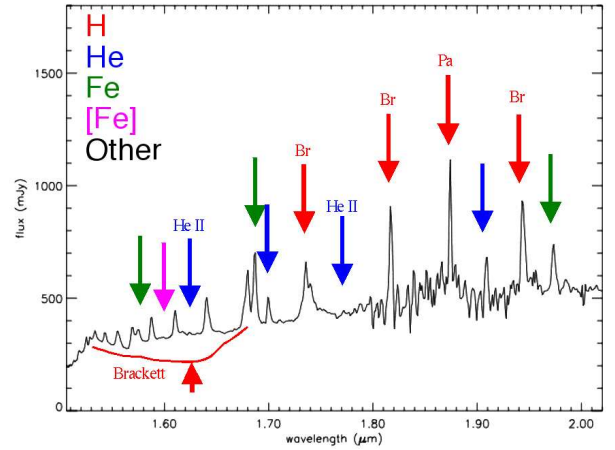


Fig. 4. NIR spectrum (1.5–2.05 μm)

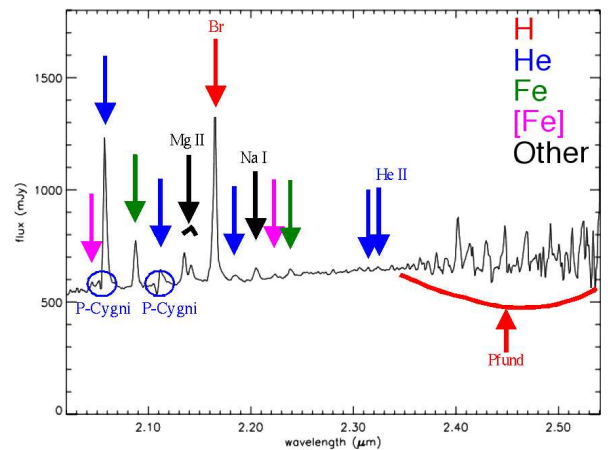


Fig. 5. NIR spectrum (2.0–2.55 μm)