PHOTOMETRY AND SPECTROSCOPY OF IGR J21247+5058 RADIOGALAXY WITH RTT150

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ABSTRACT

We present the results of photometry and spectroscopy of IGR J21247+5058 made by using the 1.5-m optical telescope RTT150 with Andor CCD and TFOSC instrument. R-band images obtained at 0.8 arcsec seeing conditions have allowed us to separate foreground star from point-like extragalactic source and estimate their brightness separately. Low-resolution but high S/N ratio spectra of this optically combined source confirm the presence of red-shifted H-alpha emission line of extragalactic nature. Physical properties of radio-galaxy are briefly discussed.

1. INTRODUCTION

INTEGRAL X-ray source IGRJ21247+5058 was discovered during the INTEGRAL/IBIS survey of the Galactic plane [5]. Inside the 2 arcmin error circle of the INTEGRAL position, there is the core of the bright radio source 4C50.55 (GPSR 93.319+0.394). The optical photometry and spectroscopy of the core shows puzzling appearance [1] and they assume a chance alignment between a Galactic star and a background radio galaxy at Z=0.02. Radio observations with GMRT shows inverted spectrum of the core due to strong absorption in the optically thick medium at low frequencies [3]. ISGRI data fitted using an absorbed power law with the column density fixed to galactic value provides a good fit to the spectrum with photon index 1.87, e.g. typical of active galaxies [2]. However, there is no evidence of an optical counterpart of host galaxy yet. To study the nature and properties of the source, we observed it under high spatial resolution.

2. PHOTOMETRY

We observed the field of INTEGRAL X-ray source IGRJ21247+5058 with the Russian-Turkish 1.5-m telescope (RTT150, Bakirlitepe, TUBITAK National Observatory, Turkey). We made direct imaging of the field in Rc-band starting at 17:57UT on Oct 22, 2004, using Andor CCD (2k × 2k, 0.24 ″/pixel). A series of 200 frames (by 10s exposures) was taken under good atmospheric conditions. To reduce the CCD readout time, we used 500 × 500 pixels (2 × 2 arcmin) subframe centered on the core of the bright radio source GPSR 93.319+0.394 (Fig. 1a, radio source marked with yellow cross). We selected 185 frames with seeing better then 1 arcsec. All data were pre-processed (BIAS, DARK subtraction, flat-field correction) using IRAF.NOAO.CCDRED facilities. All selected images were matched and combined to an image with total exposure 1850 sec. The bright star at the radio source position and the neighbouring star S2 in the combined image were subtracted by PSF-subtraction algorithm using ASTROLIB library for IDL. The residual image is shown in Fig.1b (subtracted bright stars are marked with red cross). At ~1 arcsec east from the star's position, there is a faint star-like source. The galactic color excess obtained for galactic coordinates of the source (l = +93°.38, b = +0°.53) is E(B-V)=2.43 [4]. Our estimation of R_c magnitudes and the astrometry of the star and the source, assuming source intrinsic V-R color to be about 0^m, are given in Table 1. The astrometrical accuracy is ± 0.1 arcsec. The photometric errors are caused by the photon statistics.

Table 1.

	RA J2000.0	DEC J2000.0	mag R_c
Star	21:24:39.26	+50:58:26.5	15.555 ± 0.003
AGN	21:24:39.37	+50:58:26.2	18.430 ± 0.010

We found no extended structure around the source (Fig. 1c, subtracted star-like source is marked with blue cross). The limiting magnitude of the combined image is about 23^m. It means that light contribution of the host galaxy to the AGN must be less than 1%.

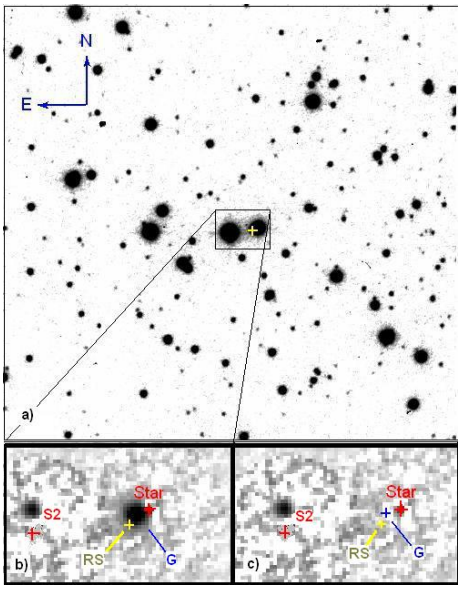

Fig. 1. a) RTT150 field of view, the radio source GPSR 93.319+0.394 is marked with yellow cross; b) residual image after PSF subtraction of bright star close to RS position and neighbouring star S2; c) same as b) with PSF subtraction of point-like extragalactic source G.

3. SPECTROSCOPY

Additionally, we obtained low resolution spectra of the galactic star+AGN using TFOSC in 2005 on Aug 08 and 11. We used grizm #15 (spectral range is 4000-9000 Å) and grizm #8 (5800-8000 Å) with a slit of 100 μm width (1.8 arcsec). At the beginning and at the end of spectral images, we also secured spectra of neon and helium lamps for wavelength calibration. In Figures 2 and 3, we present normalized to continuum spectra with a resolution ~15 Å and with a higher resolution ~ 6 Å, respectively. They are the composite spectra of the galactic star with absorption lines at Z=0 and the extragalactic source with broad emission feature around 6700 Å. Assuming this emission to be due to H-alpha, the measured redshift is Z=0.019, which is in agreement with the value found by [1].

Assuming a cosmology with H_0=65 km·s^{-1}·Mpc^{-1}, Ω_Λ=0.7 and Ω_m=0.3 and using interstellar reddening law, the luminosity of the source in R_c-band would be 5.6×10^{43} erg·s^{-1}. So, the optical luminosity is 2.4 times less than the estimated X-ray luminosity (20-100 keV) by [1].

4. CONCLUSION

RTT150 optical observations with sub-arcsecond seeing and low resolution spectra confirm the hypothesis of superposition of a radio source onto a 'normal' F/G galactic star proposed by [1]. Visible

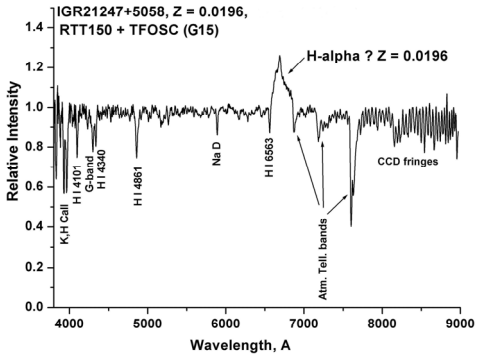

Fig. 2. Normalized composite spectrum of IGR J21247+5058 and foreground star (resolution ~15 Å)

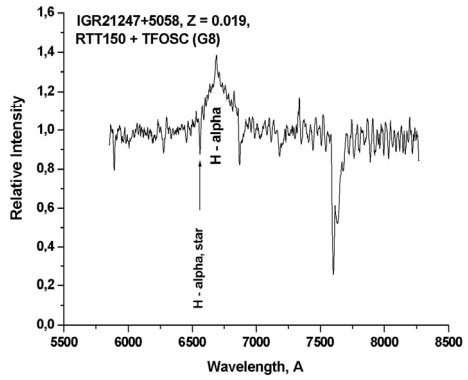

Fig. 3 Normalized composite spectrum of IGR J21247+5058 and foreground star (resolution ~6 Å)

surface brightness of the host galaxy must be fainter than 23 mag·arcsec^{-2} in R_c. Its light contribution to the AGN is less then 1%. Optical luminosity of the AGN is estimated as 5.6×10^{43} erg·s^{-1}.

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5. REFERENCES

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