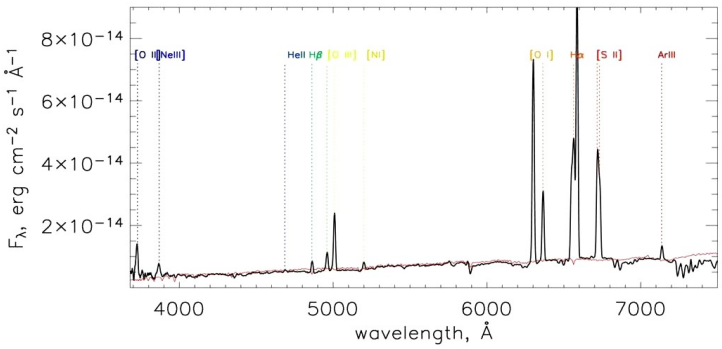
Optical Spectroscopy of the Eastern Filament of W50

O. Maryeva, P. Abolmasov, A. Burenkov and A. Moiseev

Abstract:

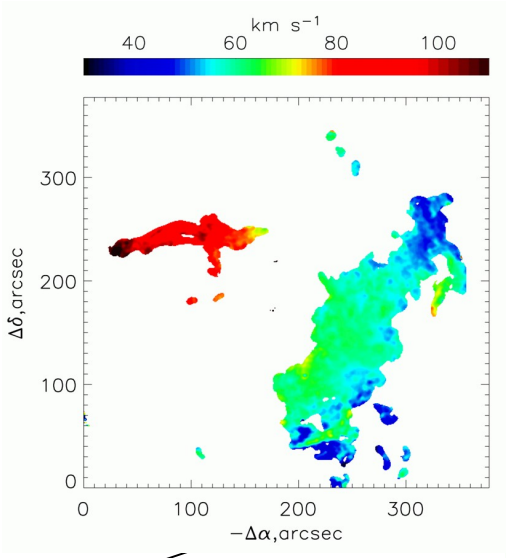
We present the results of long-slit and FPI spectroscopy of the Eastern optical filament of the radionebula W50, associated with the well-known peculiar binary SS433. Archival long-slit data obtained in July 2006 were used. Spectra were acquired in the wavelength range 3700-7300Å. Several emission lines including HeIIλ4686 are detected for the first time. We estimate interstellar reddening as E(B-V)=1.^{m}28, electron temperature as ≈12500K. From the available data we can set only the upper limit for the electron density <180cm^{-3}. We analyze the distribution of different parts of the filament on ionization diagrams. Line profiles show radial velocity variations in the range 50÷70km s^{-1}, but a fainter offset filamentary structure is present with a velocity about 90km s^{-1}. Our results are consistent with the optical filaments being powered by the EUV/X-ray radiation from high-velocity shock waves in the Eastern lobe of W50 or from SS433.



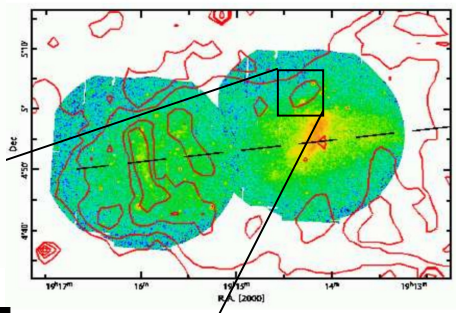
Integral spectrum, long-slit spectroscopy data. Stellar population spectrum (GALAXEV exponential star formation, age 12Myr) is shown by red.

Emission line fluxes in the integral spectrum

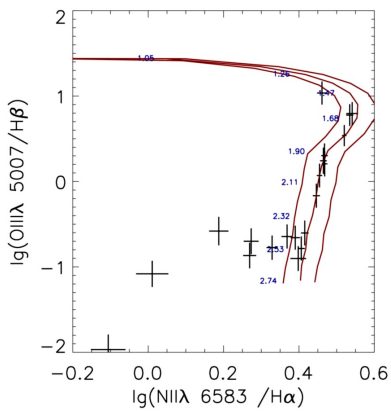
Line ID	Flux, 10^{-14} erg cm^{-2} s^{-1}	F(λ)/F(Hβ)
[OII] λ3727	15± 1	3.16± 0.26
[NeIII] λ3869	6.2± 0.6	1.35± 0.12
HeII λ4686	0.8± 0.11	0.18± 0.02
Hβ λ4861	4.6± 0.3	1± 0.06
[NI] λ5200	3.9± 0.2	0.84± 0.04
[ArIII] λ7135	7.4± 0.2	1.6± 0.05
[OIII] λ4959	9.6 ± 0.1	2.09± 0.02
[OIII] λ5007	28.8± 0.3	6.26± 0.07
[OI] λ6300	22± 5	4.8± 1.
[OI] λ6363	7.4± 1.5	1.6± 0.33
[SII] λ6717	55± 3	11.87± 0.61
[SII] λ6731	36± 3	7.77± 0.6
[NII] λ6548	45± 5	9.81± 1.16
Hα λ6562	58± 5	12.63± 1.19
[NII] λ6583	135± 6	29.42± 1.33



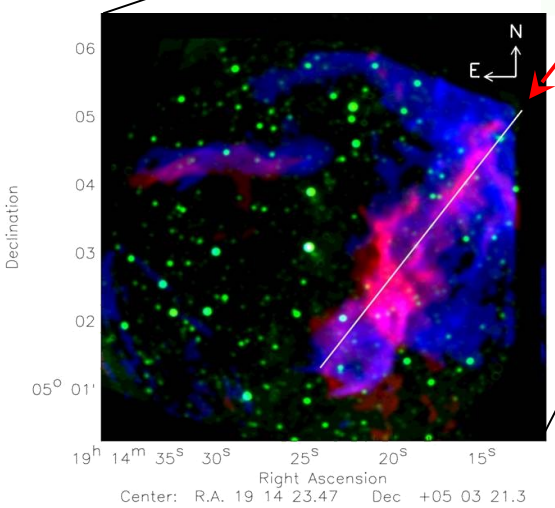
radial velocities, [SII]λ6717, FPI data



X-ray image (*Chandra*) + radio (red contours)



Spatially-resolved ionization diagram. Cloudy model grids with variable hydrogen density (lg n_e(cm^{-3}) is shown by blue figures) are shown. Power-law ionizing source with α=-0.5 ($F \propto \nu^{\alpha}$) is assumed, metallicity Z=1.6Z , nitrogen abundance is additionally enhanced by factors 1.6, 1.8 and 2 (three red curves).



Long slit position

Intensities, FPI data

Stellar continuum (~V)

[SII]λ6717

[OIII]λ5007

References:

2. Boumis P., Meaburn J., Alikakos J. 2007 MNRAS, 381, 308
3. Brinkmann W., Pratt G. W., Rohr S., Kawai N., Burwitz V. 2008, accepted by A&A; astro-ph/0610781
4. Bruzual G. & Charlot S. 2003, MNRAS, 344, 1000
5. Ferland G. J., Korista K. T., Verner D. A., Ferguson J. W., Kingdon J. B. & Verner E. M. 1998 PASP, 110, 761
6. Zealey W. J., Dopita M. A., Malin D. F. 1980 MNRAS, 192, 731