

STUDYING SHOCK AND AMBIENT ISM PROPERTIES IN BALMER-DOMINATED SUPERNOVA REMNANTS

S. Knežević¹, S. Schulze², R. Bandiera³, G. Morlino³
and J. C. Raymond⁴

¹*Astronomical Observatory, Volgina 7, 11060 Belgrade, Serbia*

²*The Oskar Klein Centre, Department of Physics, Stockholm University,
AlbaNova University Center, SE 106 91 Stockholm, Sweden*

³*INAF – Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5,
I-50125 Firenze, Italy*

⁴*Harvard-Smithsonian Center for Astrophysics, 60 Garden Street,
Cambridge, MA, 02138, USA*

E-mail: sknezevic@aob.rs

Balmer-dominated shocks are mainly seen as faint edge-on optical filaments around young supernova remnants (SNRs). These shocks are non-radiative, collisionless and propagating through partially ionized interstellar medium (ISM). Among all hydrogen Balmer lines, H α is the brightest with a characteristic two-component line profile. A narrow component with a width of $\sim 10 \text{ km s}^{-1}$ is a result of pre-shock hydrogen atoms excited downstream of the shock and a broad component with a width of $\sim 1000 \text{ km s}^{-1}$ is produced in charge-exchange reactions with the post-shock protons. These components are an important diagnostic tool for ISM and shock parameters: ambient density and neutral fraction, pre- and post-shock temperature, shock velocity, electron-to-proton temperature ratios upstream and downstream of the shock. Moreover, presence of shock precursors such as cosmic rays and neutral-induced precursor can alter H α -line profile. We will show spectroscopic observations of Galactic SNRs SN 1006 and Tycho, and SNR 0509-67.5 in Large Magellanic Cloud.