Hadronic versus leptonic origin of the gamma-ray emission from Supernova Remnant RX J1713.7-3946

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Abstract. **The hadronic vs. leptonic origin of the gamma-ray emission from the Supernova Remnant RX J1713.7-3946 is discussed both in the light of new observations and from a theoretical point of view. The existing good spatial correlation of the gamma-ray emission and the nonthermal X-ray emission is analyzed theoretically. In addition, the recently published new H.E.S.S. observations define the energy spectrum more precisely, in particular at the high and low energy ends of the instrument's dynamical range. There now exist much more constraining X-ray observations from Suzaku that extend substantially beyond 10 keV. These new data are compared with the authors' previous theoretical predictions, both for dominant hadronic and for simple inverse Compton models. Apart from the well-known MHD correlation between magnetic field strength and plasma density variations, emphasized by the wind-bubble-structure of the remnant, it is argued that the regions of magnetic field amplification also are correlated with enhanced densities of accelerated nuclear particles and the associated streaming instabilities. Therefore a correlation of nonthermal X-ray and gamma-ray emission is not only possible but even to be expected for a hadronic emission scenario. A leptonic origin of the gamma-ray emission would require an implausibly uniform strength of the magnetic field. The observational and theoretical inferences about substantial field amplification in this remnant agree very well with the recent X-ray and gamma-ray observations. All this argues strongly for the dominance of hadronic gamma rays in the gamma-ray emission spectrum and a fortiori for an overwhelming contribution of nuclear cosmic ray particles to the nonthermal energy in this remnant.**

Keywords**: Supernova remnant RX J1713.7-3946, Nonthermal emission, Hadronic vs. leptonic gamma-rays**