

# Spinning-up: the case of the symbiotic X-ray binary 3A 1954+319

F. Fürst<sup>a</sup>, D. M. Marcu<sup>b</sup>, K. Pottschmidt<sup>b</sup>, V. Grinberg<sup>a</sup>, J. Wilms<sup>a</sup>, and M. Cadolle Bel<sup>c</sup>

<sup>a</sup>Dr. Karl Remeis-Sternwarte & ECAP, University Erlangen-Nuremberg, Bamberg, Germany

<sup>b</sup>CRESST/NASA-GSFC, Greenbelt, MD, USA & UMBC, Baltimore, MD, USA

<sup>c</sup>ESAC, Madrid, Spain

We present a timing and spectral analysis of the variable X-ray source 3A 1954+319. Our analysis is mainly based on an outburst serendipitously observed during *INTEGRAL* Key Program observations of the Cygnus region in 2008 fall and on the *Swift*/BAT longterm light curve. Previous observations, though sparse, have identified the source to be one of only nine known symbiotic X-ray binaries, i.e., systems composed of an accreting neutron star orbiting in a highly inhomogeneous medium around an M-giant companion. The spectrum of 3A 1954+319 above  $> 20$  keV can be best described by a broken power law model. The extremely long pulse period of  $\sim 5.3$  hours is clearly visible in the *INTEGRAL*/ISGRI light curve and confirmed through an epoch folding period search. Furthermore, the light curve allows us to determine a very strong spin up of  $-2 \times 10^{-4}$  h during the outburst. This spin up is confirmed by the pulse period evolution calculated from *Swift*/BAT data. The *Swift*/BAT data also show a long spin-down trend prior to the 2008 outburst, which is confirmed in archival *INTEGRAL*/ISGRI data. We discuss possible accretion models and geometries allowing for the transfer of such large amounts of angular momentum and investigate the harder spectrum of this outburst compared to previously published results.

8th *INTEGRAL* Workshop “The Restless Gamma-ray Universe” - *Integral2010*,  
September 27-30, 2010  
Dublin Ireland

\*Speaker.