J112a Spectral and lightcurve orbital modulation of Vela X-1 observed with MAXI

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Vela X-1 is among the best studied and most luminous accreting X-ray pulsars. However, its relatively long orbital period ($\sim$ 8.9 d) makes difficult a systematic study of the X-ray emission variation from the neutron star along the binary orbit. We took advantage of the All Sky Monitor MAXI/GSC data to perform, for the first time, orbital phase resolved spectroscopy at all orbital phases. The data span over more than 4 years and allow a time resolution of 6 h, suitable to analyze orbital light curve features. Studying the orbital profiles in the $4-10$ keV and $10-20$ keV energy bands, we found a a population of them which deviates significantly from the average (folded) orbital light curve. About $\sim$ 20% of this population shows a dip around the apoastron (i.e., shows a double-peaked orbital profile), that can not be explained by absorption from physical values of neutral matter. We extracted orbital phase resolved spectra of the double-peaked, as well as of the average population, in 3 and 7 phase bins, respectively, all of which can be well fitted by a simple absorbed power-law model. In both cases we found a hardening of the spectrum around the apoastron phases, by $\sim$ 0.25 in terms of photon index, compared to those at earlier and later phases. Independently of this spectral slope change, the column density increases at later phases, in agreement with previous investigations. This is indicative of an X-ray spectral modulation that is connected with orbital features and it is possibly due to geometrical properties of the binary system. We discuss our results in the framework of possible scenarios.