Title:	Unravelling the unusually curved X-ray spectrum of RGB J0710 + 591 using AstroSat observations
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Abstract:	We report the analysis of simultaneous multiwavelength data of the high-energy-peaked blazar RGB J0710 + 591 from the Large Area X-ray Proportional Counters, Soft X-ray focusing Telescope, and Ultraviolet Imaging Telescope (UVIT) instruments onboard AstroSat. The wide band X-ray spectrum (0.35–30 keV) is modelled as synchrotron emission from a non-thermal distribution of high-energy electrons. The spectrum is unusually curved, with a curvature parameter βp ∼ 6.4 for a log parabola particle distribution, or a high-energy spectral index p2 > 4.5 for a broken power-law distribution. The spectrum shows more curvature than an earlier quasi-simultaneous analysis of Swift–XRT/NuSTAR data where the parameters were βp ∼ 2.2 or p2 ∼ 4. It has long been known that a power-law electron distribution can be produced from a region where particles are accelerated under Fermi process and the radiative losses in acceleration site decide the maximum attainable Lorentz factor, γmax. Consequently, this quantity decides the energy at which the spectrum curves steeply. We show that such a distribution provides a more natural explanation for the AstroSat data as well as the earlier XRT/NuSTAR observation, making this as the first well-constrained determination of the photon energy corresponding to γmax. This in turn provides an estimate of the acceleration time-scale as a function of magnetic field and Doppler factor. The UVIT observations are consistent with earlier optical/UV measurements and reconfirm that they plausibly correspond to a different radiative component than the one responsible for the X-ray emission.
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