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X-ray Bursts from Accreting Neutron star LMXBs

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Intense X-ray bursts (type-I bursts), originating from unstable thermonuclear conflagration, are observed from the surfaces of many accreting neutron star Low Mass X-ray Binary (LMXB) systems and are useful tools to constrain the equation of state and probe strong gravity regime. A series of such X-ray bursts were observed during the 2010 outburst of the transient pulsar IGR J17480-2446. These bursts were quite unique in nature, due to their smoothly varying periodicity with the shortest recurrence time observed till date and the lack of cooling during decay. The atypical nature of these bursts suggested them to be the type-II bursts originating from accretion disc instability and thus raises questions regarding the origin of mHz QPOs observed at the outburst peak. Using Rossi X-ray Timing Explorer (RXTE) PCA data, we show that the bursts are indeed of thermonuclear origin and confirm the quasi-stable nuclear burning model of mHz QPOs. This transient source is only the second source to show atoll-Z transition and it spans a large intensity range during the outburst showing hysteresis in the Hardness-Intensity Diagram (HID). From the study of the spectral state evolution of this source during the outburst, we show that the burst properties are highly correlated with accretion and thus the evolution of the properties of the highly frequent bursts with spectral states offers the perfect laboratory to study thermonuclear ignition mechanism and the physics of recurrent bursts.

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