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The Crab pulsar: Examining its profile and deriving high precision X-ray ephemerides

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We present here the results of an analysis of 15 years of regular XMM-Newton EPIC pn observations of the Crab pulsar. The analysis of its pulse profile is based on a multi-harmonic decomposition using a new periodogram statistic which is ideally suited for studying the details of the characteristics of peaked pulse profiles such as the Crab's, especially in time-tagged event data. The decomposition and generalised modified Rayleigh statistic are both applied and presented here for the first time. Their application is extended to study the time-dependent evolution of the pulsar's emission over this 15 year period and 70 individual observations to derive high precision ephemerides based solely on the X-ray data.

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