Abstract
Black-hole soft X-ray transient systems (SXTs) are low-mass X-ray binaries (LMXBs) containing an accreting black hole that have long (periods of quiescence interrupted by outbursts of low-energy (soft X-ray). Such behavior is interpreted through the disc instability model which reported in van Paradijs (1996). These systems show X-ray variability on timescales of days to months and sometimes even much faster, which are characterized by X-ray spectral states defining the so-called hard and soft states. Studying X-ray variability plays a vital role in understanding the nature of physical processes and emission mechanisms in this type of systems.
In this thesis, we present a spectral analysis of the black hole candidate (BHC) and X-ray transient source SWIFT J1753.5-0127 making use of simultaneous observations of XMM-Newton and Rossi X-ray Timing Explorer (RXTE) in 2006, when the source was in outburst. The aim of this work is to study the X-ray continuum spectrum of SWIFT J1753.5-0127, to investigate the nature of radiation processes in the low/hard state, and further to test the presence of a soft component due to the accretion disc in the X-ray spectrum. We first fit the data with two models (POWER-LAW and COMPTT) describing the Comptonization of soft X-ray photons off the relativistic electrons in the surrounding corona. We further model the broadband spectrum with reflection component (REFLIONX, PEXRAV, and PEXRIV) to account for reflection of hard X-ray photons off the relatively cold accretion disc.
We fit the data with a range of spectral models, and we find that for all of these models the fits to the X-ray energy spectra significantly require the addition of the disc black-body component, in consistent with result of a previous analysis of this same source (Miller et al. We also find a broad iron emission line at around 6.5 keV, most likely due to iron in the accretion disc. The fits of the X-ray broadband continuum is found to show an equally good description of the data in terms of the reduced $\chi^2$. Our results confirm the existence of a cool inner disc extending near or close to the innermost circular orbit (ISCO).