Multimessenger astronomy with pulsar timing and X-ray observations of massive black hole binaries

A. Sesana, C. Roedig, M.T. Reynolds, M. Dotti

(Submitted on 14 Jul 2011 (v1), last revised 19 Jul 2011 (this version, v2))

We demonstrate that very massive (>10^8\msun), cosmologically nearby (z<1) black hole binaries (MBHBs), which are primary targets for ongoing and upcoming pulsar timing arrays (PTAs), are particularly appealing multimessenger carriers. According to current models for massive black hole formation and evolution, the planned Square Kilometer Array (SKA) will collect gravitational wave signals from thousands of such massive systems, being able to individually resolve and locate in the sky several of them (maybe up to a hundred). By employing a standard model for the evolution of MBHBs in circumbinary discs, with the aid of dedicated numerical simulations, we characterize the gas-binary interplay, identifying possible electromagnetic signatures of the PTA sources. We concentrate our investigation on two particularly promising scenarios in the high energy domain, namely, the detection of X-ray periodic variability and of double broad K\alpha iron lines. Up to several hundreds of periodic X-ray sources with a flux >10^-13 erg s^-1 cm^-2 will be in the reach of upcoming X-ray observatories. Double relativistic K\alpha lines may be observable in a handful of low redshift (z<0.3) sources by proposed deep X-ray probes, such as Athena. (Abridged)

Comments: 19 pages, 11 figures, submitted to MNRAS, minor revision of the reference list
Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as: **arXiv:1107.2927 [astro-ph.CO]**
(or **arXiv:1107.2927v2 [astro-ph.CO]** for this version)

Submission history

From: Alberto Sesana [view email]
[v1] Thu, 14 Jul 2011 20:00:03 GMT (1166kb)
[v2] Tue, 19 Jul 2011 22:58:59 GMT (1166kb)

Which authors of this paper are endorsers?