Gravitational radiation reaction in compact binary systems:

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abstract We study the gravitational radiation reaction in compact binary systems composed of neutron stars with spin and huge magnetic dipole moments (magnetars). The magnetic dipole moments undergo a precessional motion about the respective spins. At sufficiently high values of the magnetic dipole moments, their interaction generates second post-Newtonian order contributions both to the equations of motion and to the gravitational radiation escaping the system. We parametrize the radial motion and average over a radial period in order to find the secular contributions to the energy and magnitude of the orbital angular momentum losses, in the generic case of eccentric orbits. Similarly as for the spin-orbit, spin-spin, quadrupole-monopole interactions, here too we deduce the secular evolution of the relative orientations of the orbital angular momentum and spins. These equations, supplemented by the evolution equations for the angles characterizing the orientation of the dipole moments form a first order differential system, which is closed. The circular orbit limit of the energy loss agrees with Ioka and Taniguchi’s earlier result.