

## **Particle acceleration in relativistic magnetospheres**

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Rapidly rotating neutrons stars and black holes are the central engines of some of the most extreme astrophysical phenomena such as gamma-ray bursts, pulsars, X-ray binaries, binary mergers or active galactic nuclei. The activity of these compact objects is often associated with the creation and the launching of a relativistic magnetized plasmas accompanied by efficient particle acceleration and non-thermal radiation, but the underlying physical mechanisms are still poorly understood. The particle-in-cell method is well-suited to model these processes from first principles. Recent numerical simulations have clearly established that relativistic magnetic reconnection within the magnetosphere of pulsars and black holes plays a crucial role in dissipating magnetic energy which is then efficiently channeled into energetic particles and high-energy radiation. Results will be discussed in the context of gamma-ray pulsars, merging binary neutron stars and weakly accreting Kerr black holes.