Neutrino emission from magnetized relativistic outflows

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We consider two-component (protons plus neutrons) relativistic outflows in the regime of strong decoupling, when the Lorentz factor of the proton component relative to the neutron component is much greater than unity. Under such circumstances, inelastic nucleon-nucleon collisions lead to generation of strong magnetic field and produce powerful neutrino emission. The latter, according to the solution of hydrodynamical equations with losses, drains the major part of the outflow's kinetic energy. One of the most interesting features of the neutrino emission is that the energy of individual neutrinos (in the observer's frame) greatly exceeds the sum of energies of colliding proton and neutron.

This phenomenon is the most prominent in Gamma-Ray Bursts and complicates obtaining highly relativistic outflows. On the other hand, it increases the neutrino signal to the level, which is possible to detect, especially because the energy of neutrinos approaches several TeV.