Contribution ID: **74** Type: **not specified**

Ultra-high-energy emission from an evolving gamma-ray burst: neutrinos, cosmic rays, and gamma rays

Tuesday, 5 May 2015 16:12 (12 minutes)

Gamma-ray bursts (GRBs) are potential sources of ultra-high-energy neutrinos and, arguably, constitute the object class within which neutrino point sources may sooner be identified. For that reason, it is important to have a clear idea of what signals to expect from them. We present a model where the neutrino, gamma ray, and cosmic ray emission from the burst is made up of the superposition of emission from individual internal collisions, each one occurring at different sites within the relativistic jet of the burst, and at different stages of its evolution. As a result, collisions take place under a range of physical conditions, and we find that neutrino production through proton-photon interactions occurs predominantly in collisions around the photospheric radius, where the particle densities are higher; cosmic ray production occurs mainly in the central regions of the jet; and gamma-ray emission comes from collisions at large radii, where the optical depth is low enough for photons to be able to escape. We compute a new and robust minimal diffuse GRB neutrino flux prediction, which, in contrast to the calculations based on a single representative internal collision, is largely independent of GRB parameters other than the total energy emitted in gamma-rays and the fraction of that energy that is carried by cosmic-ray protons. While the current IceCube configuration will not be able to probe this flux, it might be within the reach of a high-energy extension of the detector.

Primary author: Dr BUSTAMANTE, Mauricio (CCAPP Ohio State University)

Co-authors: Dr MURASE, Kohta (Institute for Advanced Study); Dr BAERWALD, Philipp (Pennsylvania State University); Dr WINTER, Walter (DESY)

Presenter: Dr BUSTAMANTE, Mauricio (CCAPP Ohio State University)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger