Search for Centauro Events at RHIC-PHENIX

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A search for Centauro events has been performed in Au+Au collisions at $\sqrt{S_{NN}} = 200$ GeV by the RHIC-PHENIX detector. In the 1970's anomalous cosmic ray events were observed and named as *Centauro Event* in which large asymmetries between the number of charged clusters and γ clusters were seen. As one of scenarios, it could be interpreted as a signature of chiral symmetry restoration of the QCD vacuum at high temperature followed by a resultant misaligned QCD vacuum as the system quenches, which could produce several domains with a large deviation from the isospin symmetry of produced pions. However, those anomalous events have not been clearly observed in the past accelerator experiments. Relativistic Heavy Ion Collider (RHIC) in the new era is the best place to search for such anomalous phenomena, since the reachable total center of mass energy is almost 40 TeV which is most energetic among operational accelerators at present. The PHENIX detector has a two arm structure, each of which covers 90 degree in azimuth and $\pm$ 0.35 in pseudo rapidity. PHENIX can detect both charged particles and photons at low p_t even below 200 MeV in the same phase space. For this study a novel multi-resolution analysis technique was developed to identify such anomalous domains contained in an event. The search was made by measuring event-by-event asymmetries between the number of charged tracks and γ clusters in various locations and sizes of domains inside the available phase space based on the new technique. We will discuss the probability that such anomalous domains emerge in each event compared to the binomial distributions as the baseline fluctuations, and present the search result at PHENIX.