Abstract:

Our long-term study of hadron and nuclear interactions has been aimed at searching for new collective phenomena of secondary particles. First experimental project was carried out at the U-70 accelerator (Protvino, IHEP) with 50 GeV proton beams and a hydrogen target at the SVD-2 setup. We could get the evidence for the Bose-Einstein (pionic) condensate formation in accordance to the ideal (un) relativistic pionic gas model. We have found out the significant growth of a scaled variance of the number of neutral pions with increasing of the total (charged and neutral) multiplicity. To describe well topological cross sections in the high multiplicity region the phenomenological scheme (the gluon dominance model) has been developed. The consequent investigations have been continued with 3.5A GeV deuteron, lithium and carbon beams of the Nuclotron (JINR, Dubna) falling at the carbon target at the NIS-GIBS setup. The noticeable excess yield of soft photons ($p_T < 50$ MeV/c) is observed. The existing models based on Monte Carlo simulation and theoretical estimations predict a lower yield. At present, we realise new physical programme of hadron and nuclear researches at Nuclotron and U-70 (searching for new resonances, flows, soft photons, and others) by means of including of an electromagnetic calorimeter with the low threshold of registration.