

# Creation and evolution of topological defects in inhomogenous systems.

Tomasz Dobrowolski<sup>1</sup>

April 19, 2007

1. Institute of Physics AP, Podchorążych 2, 30-084 Cracow (Poland).

The purpose of this report is presentation of the main results concerning creation of topological defects during the continuous phase transition in inhomogenous medium. In accordance with Kibble-Zurek mechanism, the distribution of defects created during a second order phase transition in pure systems is determined solely by the correlation length at freeze-out time. The correlation length at that instant intuitively describes the size of the defect and therefore the number density of defects is limited by the possibility of holding defects in a unit volume. On the other hand if the system is populated by the impurities then defects emerge mainly in knots of the force distribution which correspond to extremes of the impurity potential i.e. positions of imperfections. The purpose of this report is to show that, due to the existence of the strong gradients in the system, defects can be created mainly in the close vicinity of the imperfections. It seems that this simple mechanism can be responsible for occurrence, in the number density formula, the additional length scale describing the impurity distribution. We know that in pure systems, as a consequence of defect-antidefect annihilation, the number density of topological defects decrease in time. In contradiction to pure systems, defects produced in the systems populated by imperfections could be confined by the impurity centers and therefore they may not disappear from the system and may remain above the level established by thermal nucleation of pairs.