Disorder effects on the static scattering function of star branched polymers

V. Blavatska[a], C. von Ferber[b,c] and Yu. Holovatch[a]

[a] *Institute for Condensed Matter Physics, National Acad. Sci. of Ukraine, UA-79011 Lviv, Ukraine*

[b] *Applied Mathematics Research Centre, Coventry University, CV1 5FB Coventry, UK*

[c] *Institut für Theoretische Physik II, Heinrich-Heine Universität Düsseldorf, D-40225 Düsseldorf, Germany*

In scattering experiments on polymer systems, which are commonly used in investigations of the structure properties of macromolecules, of interest is the static structure function $S(k)$ as function of the wave vector $\vec{k}$. We evaluate quantitative estimate for the scattering intensity $I(k) \equiv S(k)/S(0)$ on the branched f-armed star polymers in solutions in d dimensions in presence of structural defects, correlated on large distances r according to a power law $\sim r^{-a}$. In particular, we are interested in the ratio $g(f)$ of scattering intensities of star and linear polymers of the same molecular weight, which is a universal experimentally measurable quantity. We apply the direct polymer renormalization approach and evaluate results applying double $\varepsilon = 4 - d$, $\delta = 4 - a$-expansion. We found an increase of $g(f)$ with increasing the parameter δ. This can be interpreted as follows: the stronger are correlations of disorder, the smaller is the distinction between the size measure of a star and linear polymers of the same molecular weight.