Disorder effects on the static scattering function of star branched polymers
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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 \( \epsilon = 4 - d \), \( \delta = 4 - a \)-expansion. We found an increase of \( g(f) \) with increasing the parameter \( \delta \). 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.