Andreev scattering in turbulent ^{3}He-B: a three-dimensional numerical analysis

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We present a theoretical and numerical study of the Andreev scattering technique used for detection of quantized vortex structures in turbulent superfluid ^{3}He-B. We develop a numerical technique for the analysis of the Andreev reflection of quasiparticle excitations by a dense, three-dimensional vortex tangle. We analyze the integral reflection coefficient as a function of the vortex line density and discuss the rôle of screening mechanisms which strongly affect the total reflectivity of the tangle. Analysing the spectral properties of fluctuations of the Andreev-retroreflected signal and comparing them with those of the vortex line density, we find that the spectral densities of fluctuations of both quantities are strongly correlated and obey the same power law. Finally we discuss the implications of our results for the interpretation of quantum turbulence experiments in ^{3}He-B.