Two Different Regimes of the Turbulent Wave Cascade Decay on the Surface of Quantum Liquids

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We report recent results of the experimental study of capillary turbulence decay on the surface of quantum liquids: normal and superfluid ^{4}He and liquid hydrogen. In our experiments the turbulent cascade of capillary waves was damped at high frequencies due to viscous dissipation. Turbulent spectrum at high-frequency dissipative region was described by exponential decay function which was in accordance with the theoretical predictions[1,2]. Moreover, for the first time two different regimes of the turbulent wave cascade decay were observed depending on the type of pumping excitation. When the surface was excited by broad-band noise pumping, a characteristic frequency f_d of the cascade exponential decay $\sim exp(-f/f_d)$ was close to the high-frequency edge of the inertial range. Otherwise, in the case of harmonic pumping, the characteristic frequency f_d was close to the low-frequency pumping frequency. Thus, the spectrum decay was more dramatic in the case of harmonic pumping than in the case of broad-band pumping. This difference in the values of f_d can be qualitatively explained in frames of wave turbulence theory by taking into account a non-locality of 3-wave interactions in the case of harmonic pumping.

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[2]G.V. Kolmakov, JETP Lett. **83**, 58 (2006).