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Mathematics > Probability

# High-Frequency Asymptotics for Lipschitz-Killing Curvatures of Excursion Sets on the Sphere

## Domenico Marinucci, Sreekar Vadlamani

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In this paper, we shall be concerned with geometric functionals and excursion probabilities for some nonlinear transforms evaluated on Fourier components of spherical random fields. In particular, we consider both random spherical harmonics and their smoothed averages, which can be viewed as random wavelet coefficients in the continuous case. For such fields, we consider smoothed polynomial transforms; we focus on the geometry of their excursion sets, and we study their asymptotic behaviour, in the high-frequency sense. We put particular emphasis on the analysis of Euler-Poincar\'e characteristics, which can be exploited to derive extremely accurate estimates for excursion probabilities. The present analysis is motivated by the investigation of asymmetries and anisotropies in Cosmological data.

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