Distribution Density of the Random Process Derivative Probability

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Citation: Batanov M.S., Monakhova V.P., Romashova M.O. Distribution Density of the Random Process Derivative Probability, *Kompetentnost' / Competency (Russia)*, 2022, no. 5, pp. 17–23. DOI: 10.24412/1993-8780-2022-5-17-23

key words

stationary differentiable random process, derivative of random process, Planck's constant, surface roughness

The article proposes a method (procedure) for obtaining the probability distribution density function (PDDF) of the derivative of a differentiable stationary (or pseudo-stationary) random process with a known one-dimensional PDDF of this process. We have shown that the proposed procedure, up to a proportionality factor, coincides with the quantum mechanical transition from the coordinate to the momentum representation of the state of an elementary particle. An assumption that the ratio of the reduced Planck's constant to the mass of an elementary particle can be expressed through the ratio of the averaged characteristics of a stationary random process in which this particle participates was made based on a detailed analysis of the differentiable random process properties.

At the same time, the procedure proposed in the article is suitable for obtaining the PDDF of the derivative of a differentiable stationary (or pseudo-stationary) random process of any scale. We believe that the results obtained in this article are applicable in various branches of statistical physics, in particular, in the study of the properties of rough surfaces.

References

1. Rytov S.M. Vvedenie v statisticheskuyu radiofiziku. Ch.1 [Introduction to statistical radiophysics. Part 1], Moscow, *Nauka*, 1976, 494 P.
2. Tikhonov V.I. Statisticheskaya radiotekhnika [Statistical radiotechnics], Moscow, *Radio i svyaz'*, 1982, 622 P.
3. Blokhintsev D.I. Osnovy kvantovoy mekhaniki [Fundamentals of quantum mechanics], Moscow, *Vysshaya shkola*, 1963, 620 P.
4. Batanov-Gaukhman M. The Diffraction of Microparticles on Single-layer and Multi-layer Statistically Uneven Surfaces, (2020) [v2] arXiv:2007.13527.
5. Batanov-Gaukhman M. Stochastic Model of Microparticle Scattering On a Crystal Avances en Ciencias e Ingeniería (ISSN: 0718-8706), vol. 12, no. 3; https://www.executivebs.org/publishing.cl/avances-en-ciencias-e-ingenieria-vol-12-nro-3-ano-2021-articulo-4/.