

ON THE INSTANTANEOUS FREQUENCY OF GAUSSIAN STOCHASTIC
PROCESSES

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Abstract: We study the instantaneous frequency (IF) of continuous-time, complex-valued, zero-mean, proper, mean-square differentiable, nonstationary Gaussian stochastic processes. We compute the probability density function for the IF for fixed time, which generalizes a result known for wide-sense stationary processes to nonstationary processes. For a fixed point in time, the IF has either zero or infinite variance. For harmonizable processes, we obtain as a consequence the result that the mean of the IF, for fixed time, is the normalized first-order frequency moment of the Wigner spectrum.

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