Meeting: 1000, Albuquerque, New Mexico, AMS CP 1, Session for Contributed Papers

1000-65-209 **Byung Soo Moon*** (bmoon@math.usu.edu), Department of Mathematics and Statistics, Utah State University, Logan, UT 84321. *A study on the Johnson noise in transient temperatures using the sum of random sinusoidal signals.* Preliminary report.

The Johnson noise is the fluctuating electromotive force $V(t) = (2kTR)^{\frac{1}{2}}\Gamma(t)$ in an electric circuit and satisfies the Ornstein-Uhlenbeck equation $RI(t) + V(t) - L\frac{dI(t)}{dt} = 0$, where T is the temperature, R is the resistance, $I(t)$ is the electric current, L is the inductance, and $\Gamma(t)$ is a Gaussian white noise. Trying to measure $V(t)$ is not an easy task since the amplitude of $V(t)$ is extremely small and the channel noises must get picked up in any experimental setup for such measurements. Hence, a simulation technique is necessary in order to study the properties of the Johnson noise. In this paper, we first show that a sum of single frequency sinusoidal signals with random amplitudes and random phases generates a Gaussian white noise provided that the amplitudes and/or phases are uniformly distributed. Next, we prove that the number of the single frequency sinusoidal signals added in the sum determines the temperature, i.e. the temperature increases as the number of single frequency signal increases. Finally, using this random signal we find a fluctuating solution for the Ornstein-Uhlenbeck equation during the period of high energy dissipation.

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