

## Advanced Noise Generator Method of Flicker Noise Measurement

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Noise of electronic devices can be measured by comparison using a noise source at input and an output noise meter [1]. It is noise generator method. It can be used to easily obtaining equivalent input noise of semiconductor devices. But this method is usually recommended for higher frequencies, because measurement generator must give white noise [1]. Besides this, we obtain only noise level at broad band.

It is interesting to adapt noise generator method for low-frequency noise measurements. This type of noise is often used for reliability estimation of semiconductor devices [2]. Low-frequency noise is often called flicker noise,  $1/f$ -noise or excess noise. It has a non-uniform power spectral density (PSD) dependence on frequency [3].

To find the PSD of equivalent input noise source we must perform measurements by white noise generator at different frequencies. But it is a laborious procedure. For easy low-frequency input noise PSD estimation we propose the following method.

On the first stage of measurement we perform analog-to-digital convert (ADC) of semiconductor device (for example, transistor) output noise. Then performing discrete Fourier transform (DFT) of obtained samples.

On the second stage we perform digital-to-analog convert (DAC) of recorded samples. Digital-to-analog converter signal enter to semiconductor device input through attenuator. Simultaneously we are performing DFT of a corresponding output noise. Adjusting the input noise is carried out until the doubling of output noise.

Then we can compare output noise PSD and equivalent input noise PSD. After estimation of nonlinear distortion, we can adjust the measurement source of input noise.

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2. V.A. Sergeev, O.A. Dulov, *Meas. Tech.* **51**, 1122 (2008).
3. A. Piersol, *Shock Vib.* **1**, 33 (1993).