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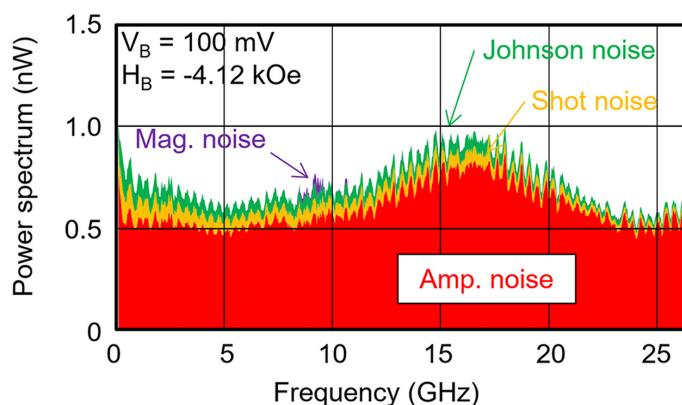


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Room-temperature measurements of the white shot noise of a spin torque oscillator at microwave frequencies offer a way to accurately characterize spintronic devices.



By exploiting the spins of electrons, researchers are developing a new type of technology called spintronics, which are more efficient than traditional electronics. One spintronic device, called a spin torque oscillator (STO), has promise as a microwave generator that is smaller, consumes less power than conventional microwave oscillators, and is still compatible with today's semiconductor fabrication techniques. In the future, these STOs could be used in wireless communication, radar, GPS and other applications.

But to design STOs that surpass conventional devices, researchers still need to better understand how they work, which requires accurate calibration of an STO measurement system. To that end, researchers in Japan report in the *Journal of Applied Physics* room temperature noise measurements of an STO, distinguishing white shot noise from magnetic noise, whose frequencies depend on magnetic field strength.

Shot noise is generated when electric current flows into the STO. Previous research measuring shot noise, which varies with bias voltage, only focused on low frequencies. This required cryogenically cooling the system to stop the magnetic fluctuations of the device, which can ruin the measurement.

Because these magnetic fluctuations only appear at low frequencies, the researchers sought to avoid them by measuring shot noise at higher, microwave frequencies. Doing so provided a way to accurately calibrate gain of the STO measurement system.

And, for the first time, the shot noise measurements were at room temperature. Without the need to operate at cryogenic temperatures, researchers can now explore how the behavior of STOs depends on a range of temperatures.

Source: "Measurement of shot noise in magnetic tunnel junction and its utilization for accurate system calibration," by S. Tamaru, H. Kubota, K. Yakushiji, A. Fukushima, and S. Yuasa, *Journal of Applied Physics* (2017). The article can be accessed at <https://doi.org/10.1063/1.5003843>.

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