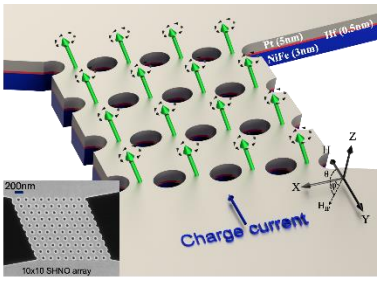
TIFX04-22-22
Nonconventional Computing

Background

Computing is the backbone of our society and affects everything we do in our daily lives in one way or another. However, on the one hand, we observe the slowing down of Moore's law (which predicts the number of transistors in an integrated circuit double up every two years), and on the other hand we generate more unstructured data than ever before. We hence need to reconsider the current computing paradigm. At the nonconventional computing lab, we are working on a new computation scheme that can address a certain type of problems that even the best computers today cannot solve within a reasonable amount of time. We work on specific devices called magnetic nano-oscillators to develop a natural computing scheme called Ising Machines (IM). We also try to mimic the brain and how efficiently it works to perform certain tasks like speech and face recognition. Do you like to know more about what we do? Do you like to know more about different magnetic phenomena, microwave and RF measurement, nano/micro fabrication and thin films?

Problembeskrivning



The constituting elements and fabric of IMs are a specific magnetic device called Spin Hall nano-oscillator. When subjected to a magnetic field and a direct current, their resistance oscillate. We detect and analyze the resulting oscillating voltage at microwave frequencies. However, we need to understand their behavior better and in a more systematic way and see how it changes at different magnitudes of field and current and how we can exactly control their response.

Arbetssätt

We deposit the layers needed for making such devices, fabricate them in the cleanroom and finally, characterize them to understand their behavior. We then compare their behavior to theoretical models and we try to optimize them and make them work as we like. You can be involved at each stage of the process that you like and you can learn many different experimental techniques that are extremely useful in different areas of science and industry.

Gruppstorlek

Detta projekt är lämpligt för en eller två grupper om 3-4 studenter.

Målgrupp

Teknisk fysik (F), Fysikprogrammet på GU (GU-Fysik), Elektroteknik (E)

Litteraturtips

Spin-torque and spin-Hall nano-oscillators, Proceedings of the IEEE 104 (10), 1919-1945

Handledare

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