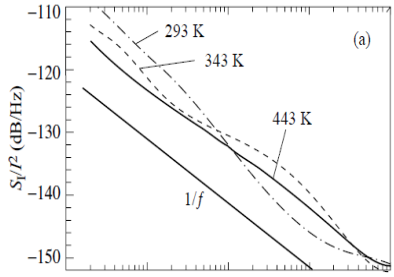
Institut für Elektronik

# Master's thesis

In cooperation with amsAG

## Evaluation of Random Telegraph Noise (RTN) in MOSFET devices




### Current Status and Motivation:

In IC design, noise is one of the performance limiting factors and therefore needs to be considered with high emphasize. The most complex semiconductor device is the MOSFET. Multiple sources of noise, such as rf noise, white or thermal noise and 1/f noise exist. In this thesis we concentrate on the low frequency 1/f noise behavior. As indicated by its naming a 1/f behavior is expected. This is true for the majority of investigated cases. For short devices a special effect can be recognized known as Lorentzian spectrum or Random Telegraph noise. The measurement of this effect on existing test structures and its analysis builds the frame of the thesis. Correlation between frequency and time domain measurements need to be done and a program for data analysis needs to be written. Existing SPICE model descriptions of 1/f noise need to be compared with the generated measurement data and the weaknesses in this formulation should be identified and pointed out in the conclusion of the work. Geometry related formulations as enhancements to existing models should be developed. A fully stochastics based model description is beyond the scope of a master thesis and therefore not part of this work.

### Research Topic(s):

Trap densities, activation energies, trapping and de-trapping mechanisms in semiconductors; Time Domain analysis / statistics; Frequency domain analysis / averaging of spectrums

### Approach / Methodology:

- Literature- and internet study: 1/f & random telegraph noise origin
- DC and flicker noise measurement in frequency domain
- Individual behaviour in time domain
- Temperature measurements
- Analysis: measurement to SPICE model comparison & validation
- Documentation

### Organisational Matters:

- Start of work: 1.6.2021
- Workplace: amsAG
- Paid thesis: 1k€/month + 3k€ bonus
- 6 month duration

### Contact person / Supervisor:

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