# Performance Analysis of Array Calibration for 3-D Imaging with Air-Coupled Ultrasound
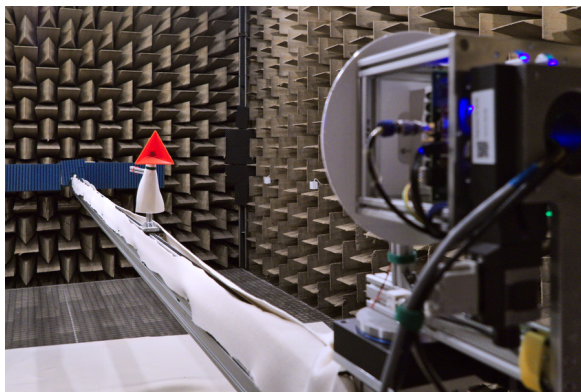
**Master Thesis Proposal**
Topics: Statistical Signal Processing, Optimization, Array Signal Processing
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Fachbereich 18
Elektrotechnik und
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## Description

Transducers for ultrasound in air suffer from high production tolerances. High-resolution imaging therefore requires calibration of the sensor elements [1].



Calibration of ultrasound array used for 3-d imaging in air.

We develop a new signal model for calibration based on a prototype air-coupled ultrasonic phased array designed and assembled by the Measurement and Sensor Technology Group at TU Darmstadt. Your task is to analyze the corresponding estimation of model parameters and derive the performance bound of each estimator [2].

As a potential candidate, you should have experience with some of the following topics:

- Statistical signal processing.
- Optimization.
- Array signal processing.
- Linear algebra.
- Numerical programming languages (MATLAB, Python, …).

Please contact Raphael Müller (✉ r.mueller@nt.tu-darmstadt.de) if you are interested.

For other current thesis topics, feel free to visit the **virtual office hour** of Prof. Pesavento on Mondays, 15:00 − 16:00.

Office Hour Link

## References

[1]  R. Müller, D. Schenck, G. Allevato, *et al.*, "Dictionary-Based Learning for 3D-Imaging with Air-Coupled Ultrasonic Phased Arrays," in *2020 IEEE International Ultrasonics Symposium (IUS)*, Sep. 2020, pp. 1–4. DOI: 10.1109/IUS46767.2020.9251726.
[2]  B. M. Sadler and T. J. Moore, "Performance Analysis and Bounds," in *Academic Press Library in Signal Processing*, vol. 3, Elsevier, 2014, pp. 297–322, ISBN: 978-0-12-411597-2. DOI: 10.1016/B978-0-12-411597-2.00008-4.