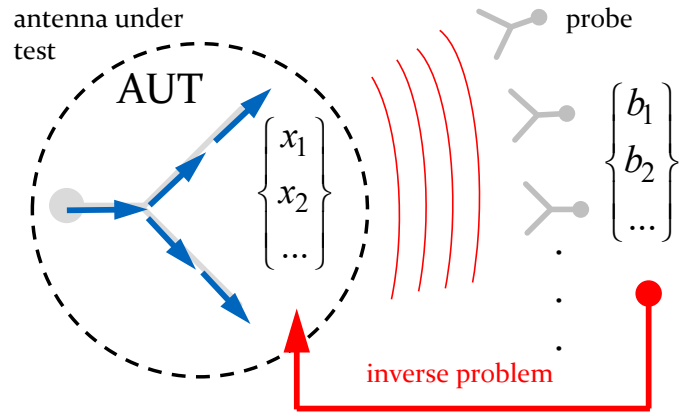
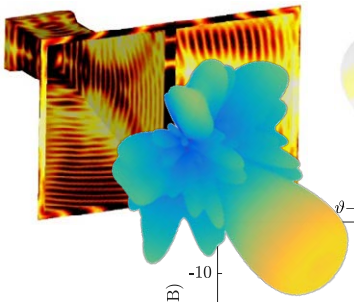
FIAFTA — Flexible and Efficient Antenna Field Transformations and Diagnostics

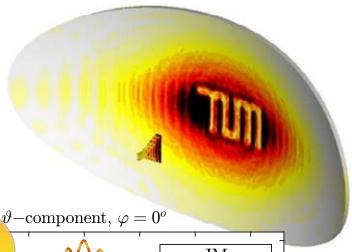
The **Fast Irregular Antenna Field Transformation Algorithm (FIAFTA)** is a general-purpose inverse source solver designed to retrieve equivalent antenna radiation sources from almost arbitrary measurement data. It is based on an integral equation formulation together with a very efficient and flexible evaluation of the integral operators as needed for the solution of the corresponding inverse source problem.
FIAFTA is the result of more than ten years of research at the Chair of High-Frequency Engineering at the Technical University of Munich and is routinely used in a variety of industrial environments. It has been proven for antennas with apertures of up to 1000 wavelengths in size.

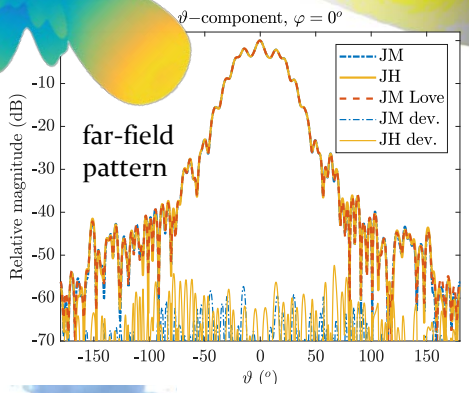


surface currents

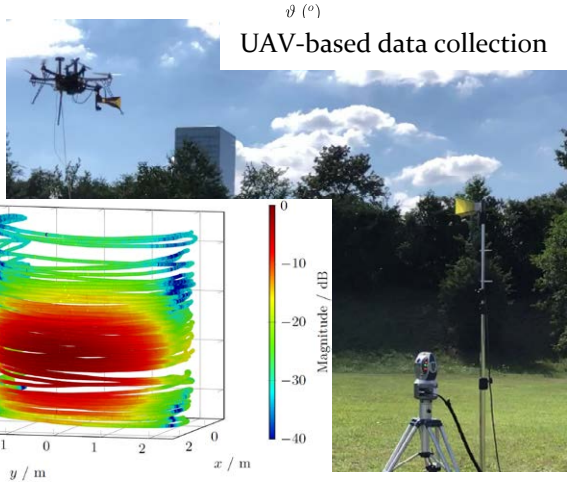


fault/feature detection?





UAV-based data collection



FIAFTA provides:

- antenna field transformation in free-space
- antenna field transformation above ground half-space (ideally conducting, dielectric, lossy dielectric)
- near-field/far-field, far-field/near-field, near-field/near-field transformation
- plane-wave synthesis
- far-field pattern results
- near-fields in arbitrary observation locations
- diagnostics information for advanced fault/feature detection
- echo suppression by spatial filtering
- integrated modelling of scatterers
- post-processing with variable ground half-space properties
- simple built-in geometry representation
- arbitrary geometry support via mesh import

FIAFTA supports:

- near-field and far-field measurements with arbitrary regular and irregular sampling grids
- field measurements with arbitrary measurement probes (full probe correction)
- various source representations (surface current densities with/without Love-condition, directive Huygens radiators, distributed spherical harmonics expansion)
- various data formats for input and output

If you are interested to obtain more information on the possibilities to use FIAFTA, please contact

Prof. T. F. Eibert, eibert@tum.de

Literature:

T.F. Eibert, C.H. Schmidt, Multilevel Fast Multipole Accelerated Inverse Equivalent Current Method Employing Rao-Wilton-Glisson Discretization of Electric and Magnetic Surface Currents, *IEEE Transactions on Antennas and Propagation*, Vol. 57, No. 4, pp. 1178–1185, 2009.

T.F. Eibert, Ismatullah, E. Kaliyaperumal, C.H. Schmidt, Inverse Equivalent Surface Current Method with Hierarchical Higher Order Basis Functions, Full Probe Correction and Multilevel Fast Multipole Acceleration (Invited Paper), *Progress in Electromagnetics Research (PIER)*, Vol. 106, pp. 377–394, 2010.

T.F. Eibert, E. Kilic, C. Lopez, R.A.M. Mauermayer, O. Neitz, G. Schnattinger, Electromagnetic Field Transformations for Measurements and Simulations (Invited Paper), *Progress In Electromagnetics Research*, Vol. 151, pp. 127–150, 2015

J. Kornprobst, R.A.M. Mauermayer, Ole Neitz, J. Knapp, T.F. Eibert, On the Solution of Inverse Equivalent Surface-Source Problems, *Progress in Electromagnetics Research*, Vol. 165, pp. 47–65, 2019.

A. Geise, O. Neitz, J. Migl, H.-J. Steiner, T. Fritzel, C. Hunscher, T.F. Eibert, A Crane Based Portable Antenna Measurement System — System Description and Validation, *IEEE Transactions on Antennas and Propagation*, Vol. 67, No. 5, pp. 3346–3357, 2019.

Chair of High-Frequency Engineering
Department of Electrical and Computer Engineering
Technical University of Munich