Analysis and Design Tools for Ultra-wideband Antennas

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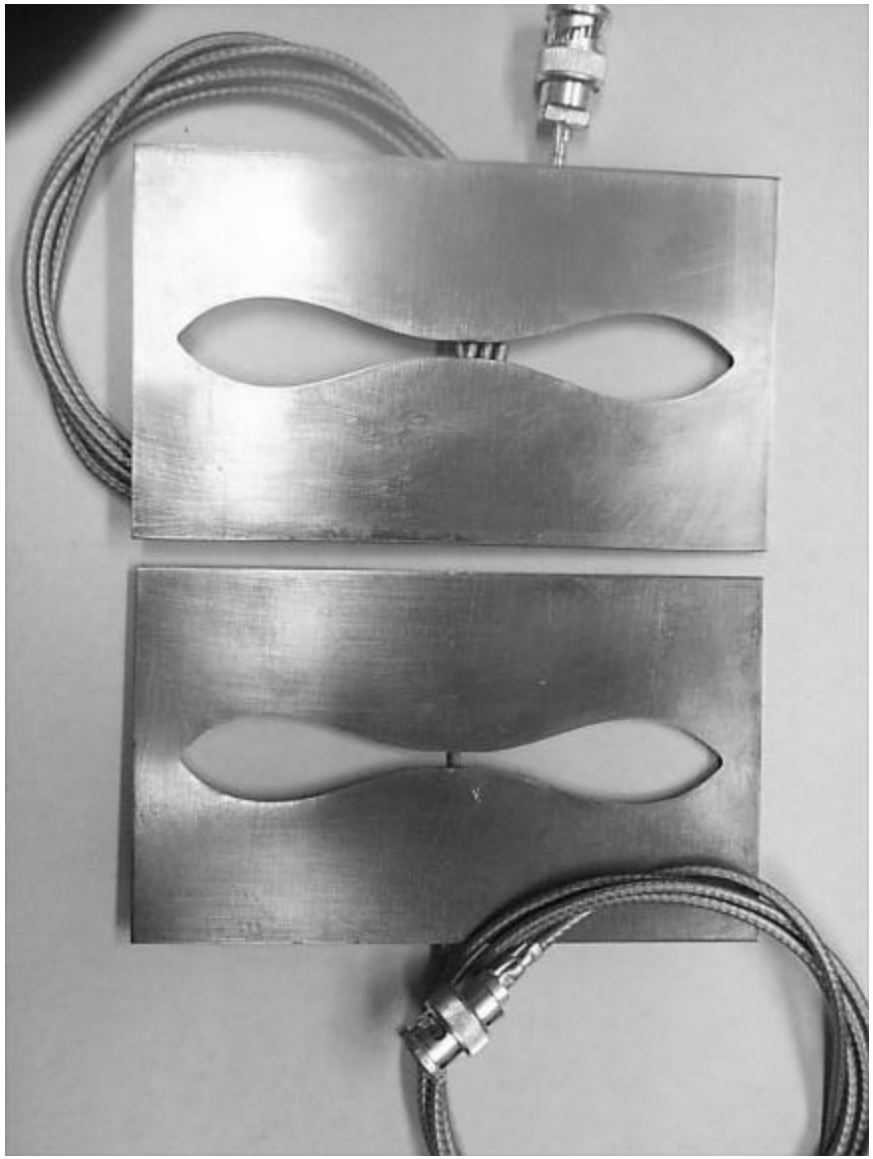
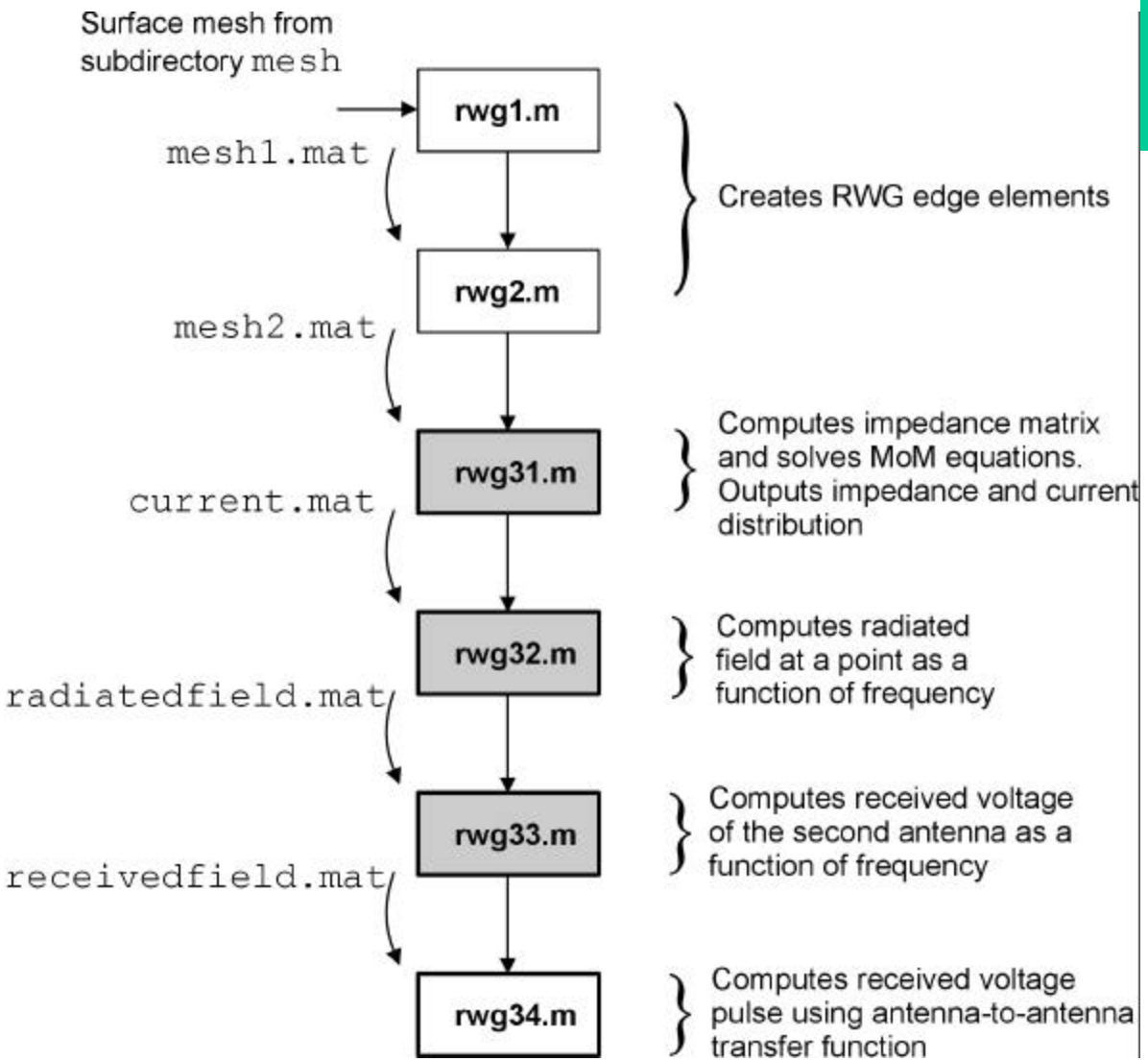
Antenna Model



Slot antenna of Time Domain, Inc., linearly polarized, without reflector

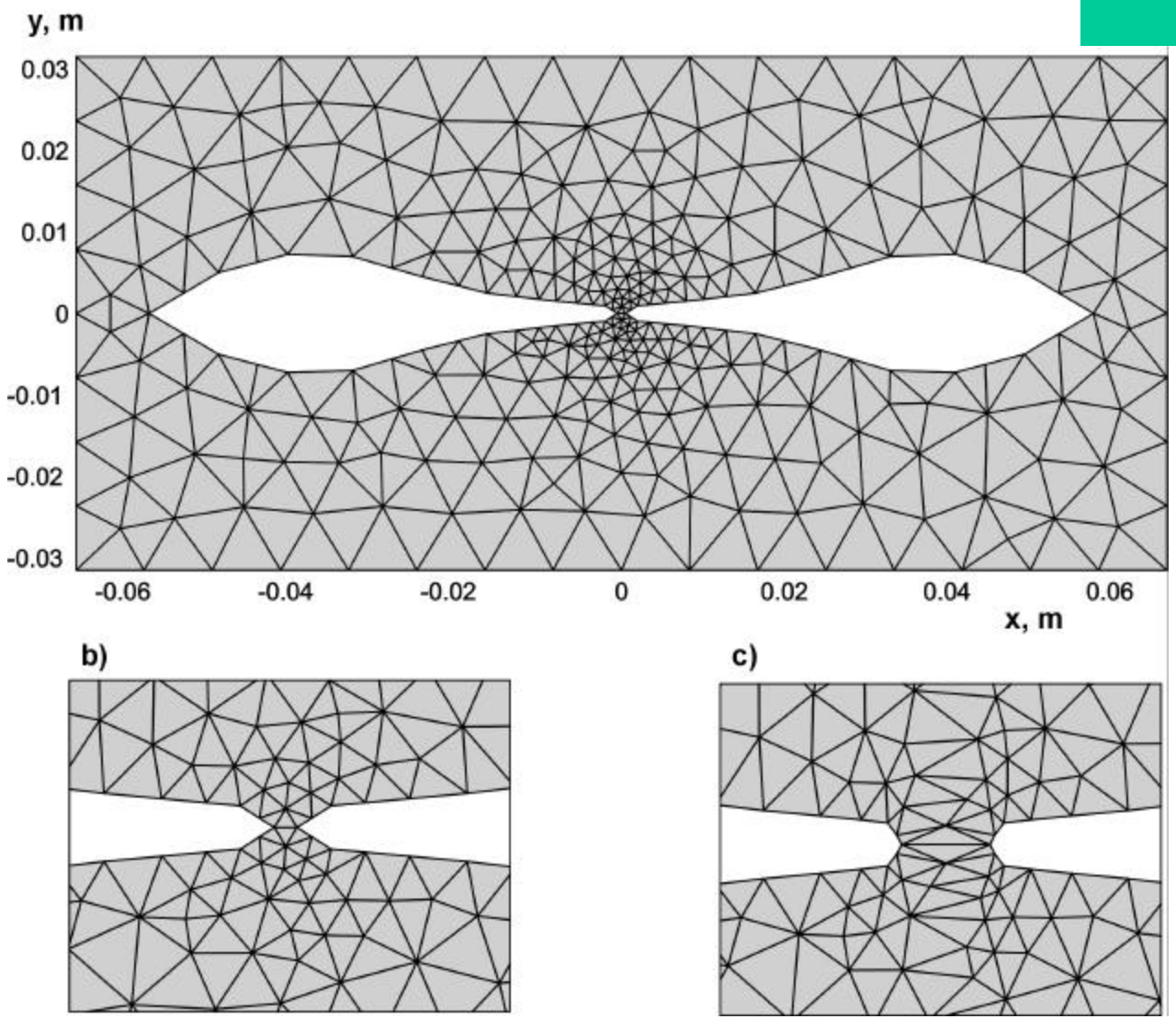
Simulation Model-Matlab



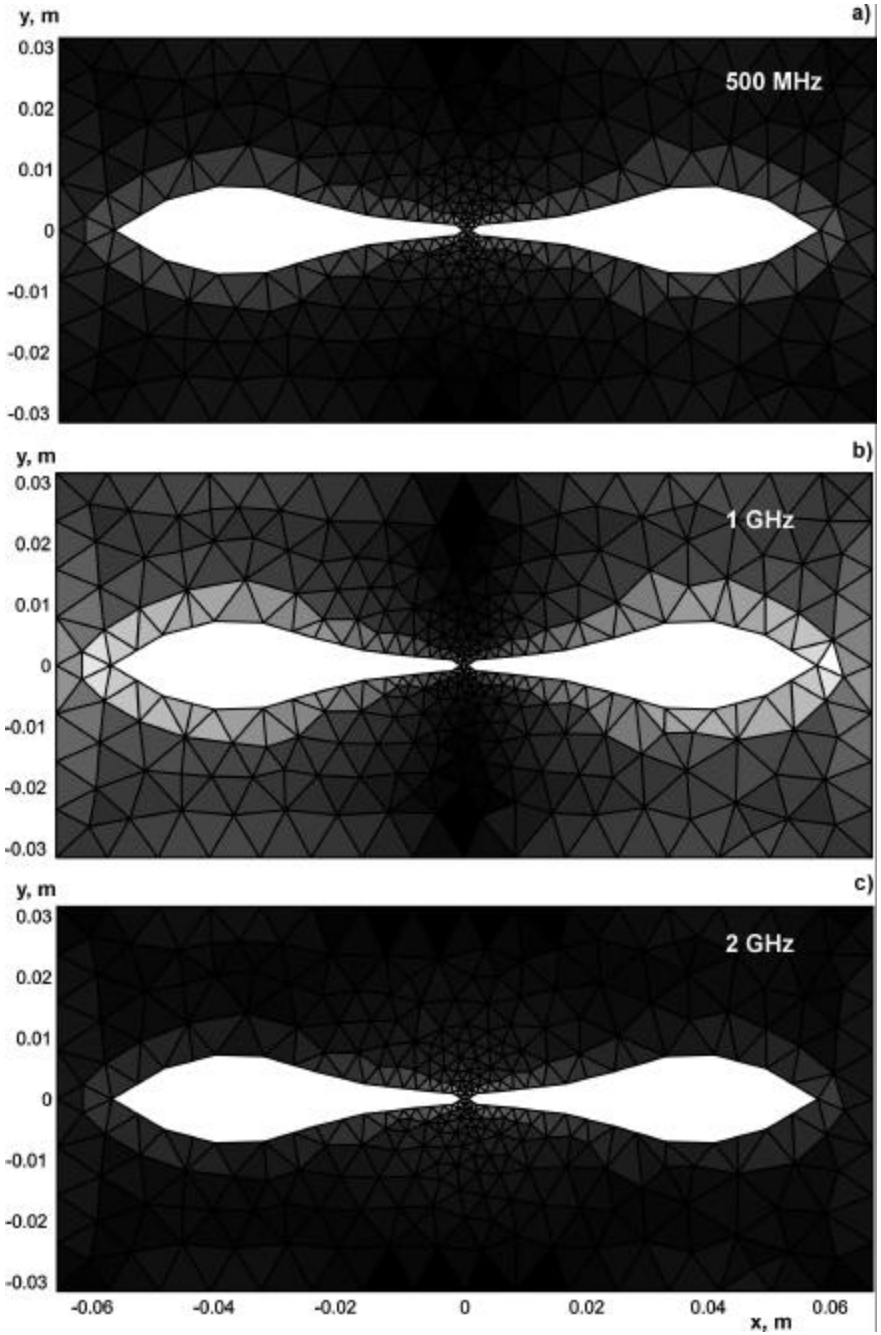
Flow chart for the time-domain analysis. Scripts containing frequency loop are grayed.

Discretization Model-Matlab PDE Toolbox

Alternatively, the mesh for the slot antenna may be created with the help of Matlab function `delaunay`.

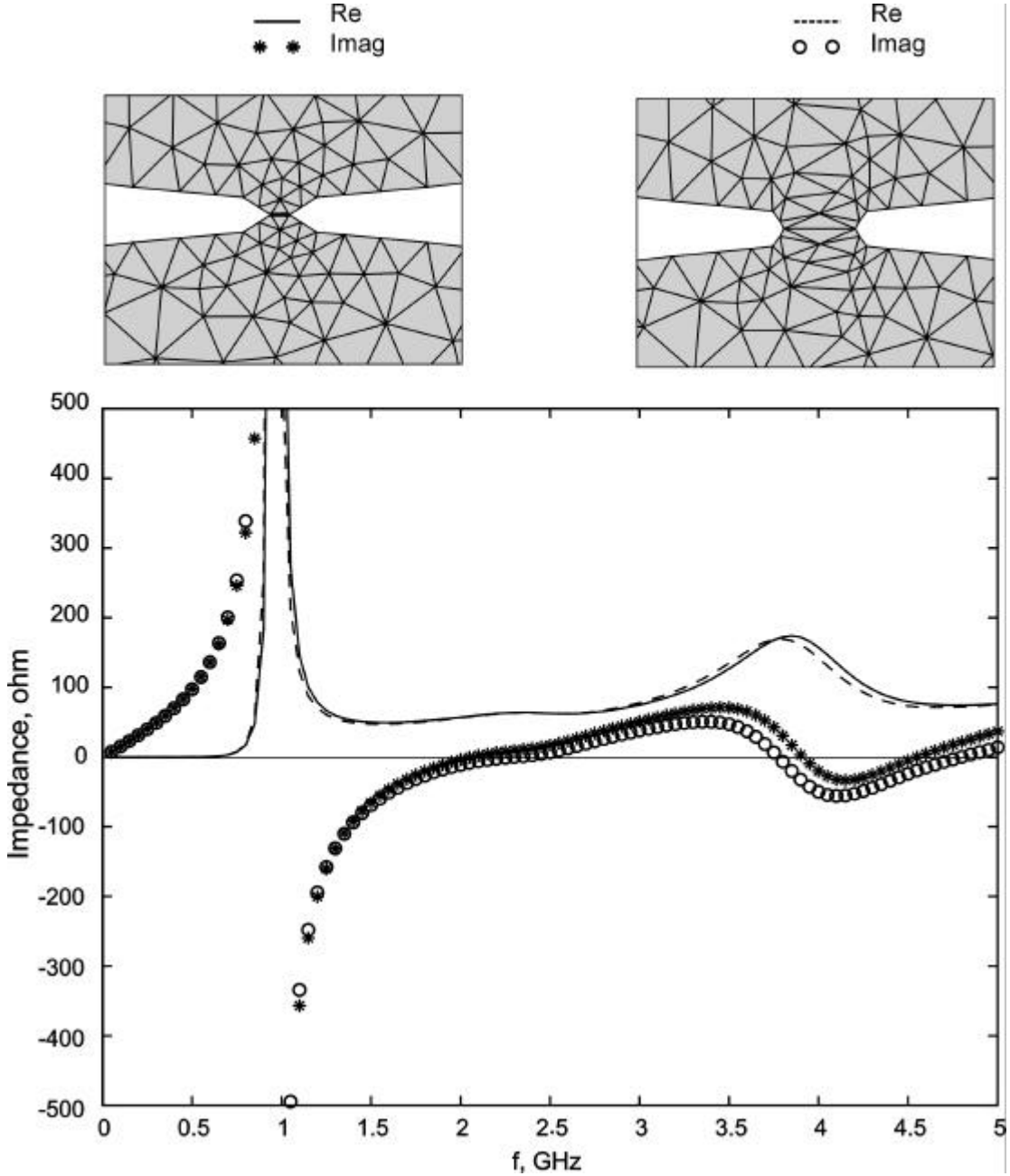


Surface current distribution



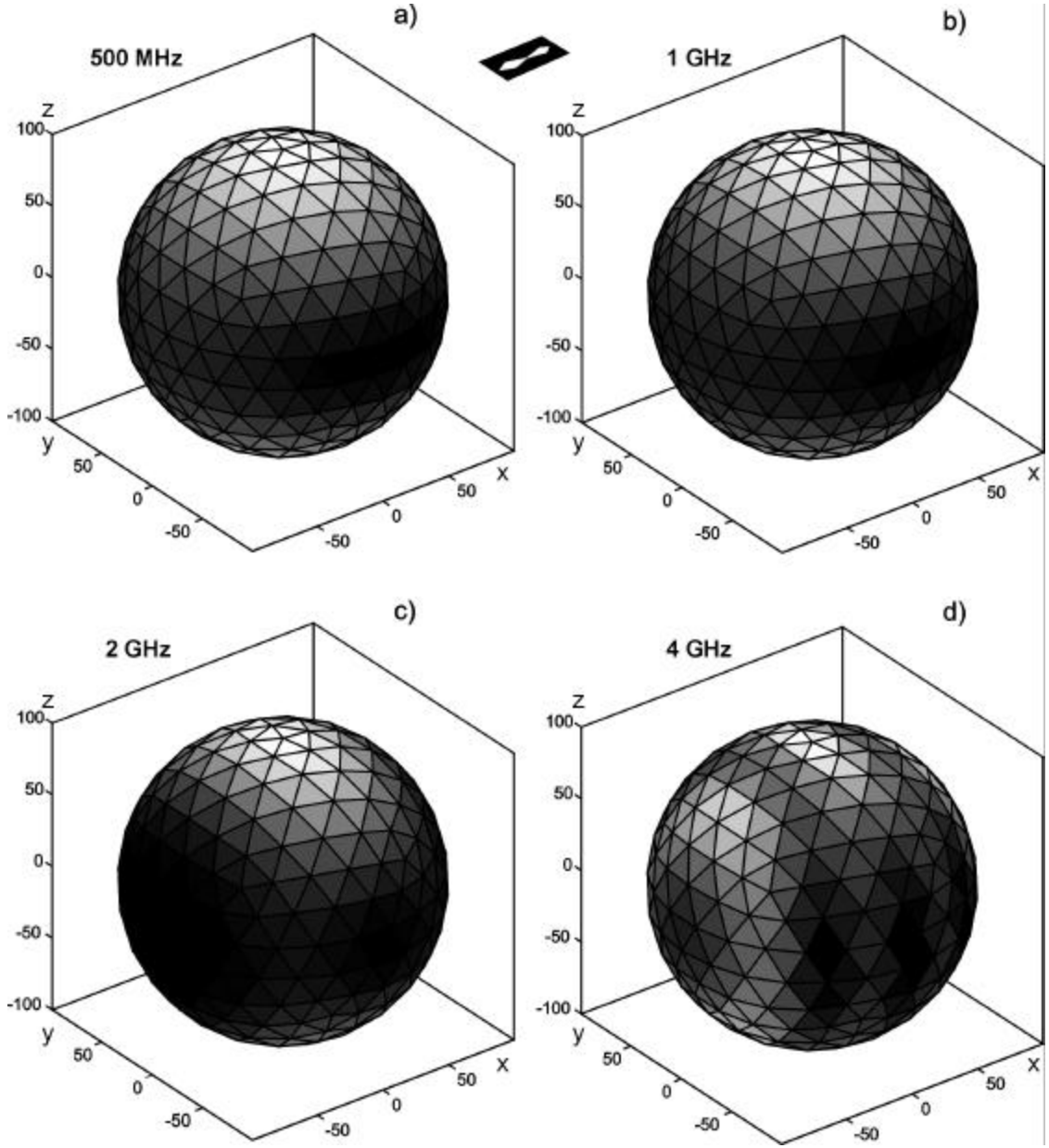
Calculated at every frequency

Input impedance



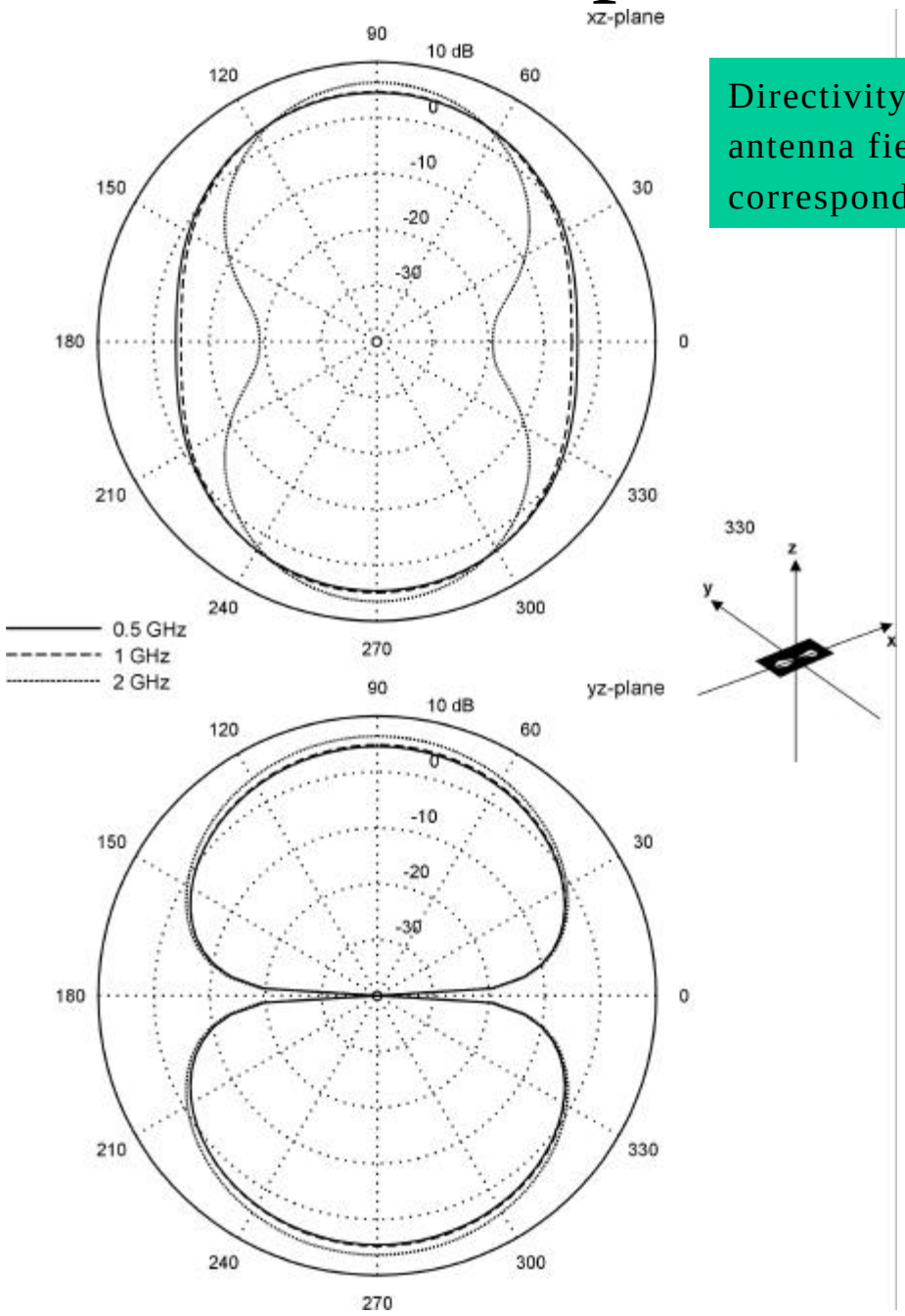
Input impedance as a function of frequency for two different feed models. Solid and dashed lines show the input resistance. The input reactance is shown by stars and circles, respectively.

Antenna radiation patterns-I



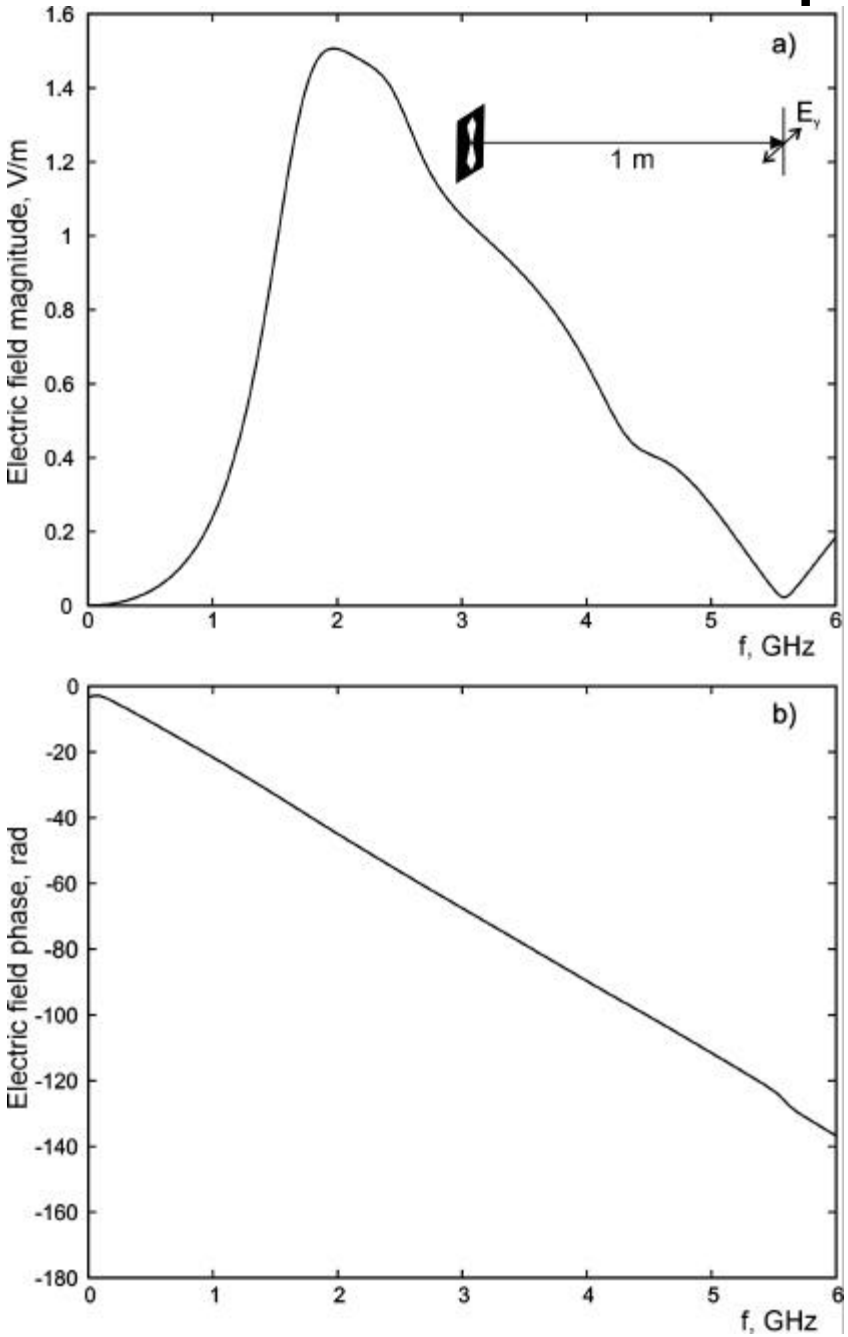
Radiation intensity distribution over the sphere surface with the radius of 100 m at four different frequencies.

Antenna radiation patterns-II



Directivity patterns of the radiated antenna field. Reference angle 90º corresponds to the z-axis.

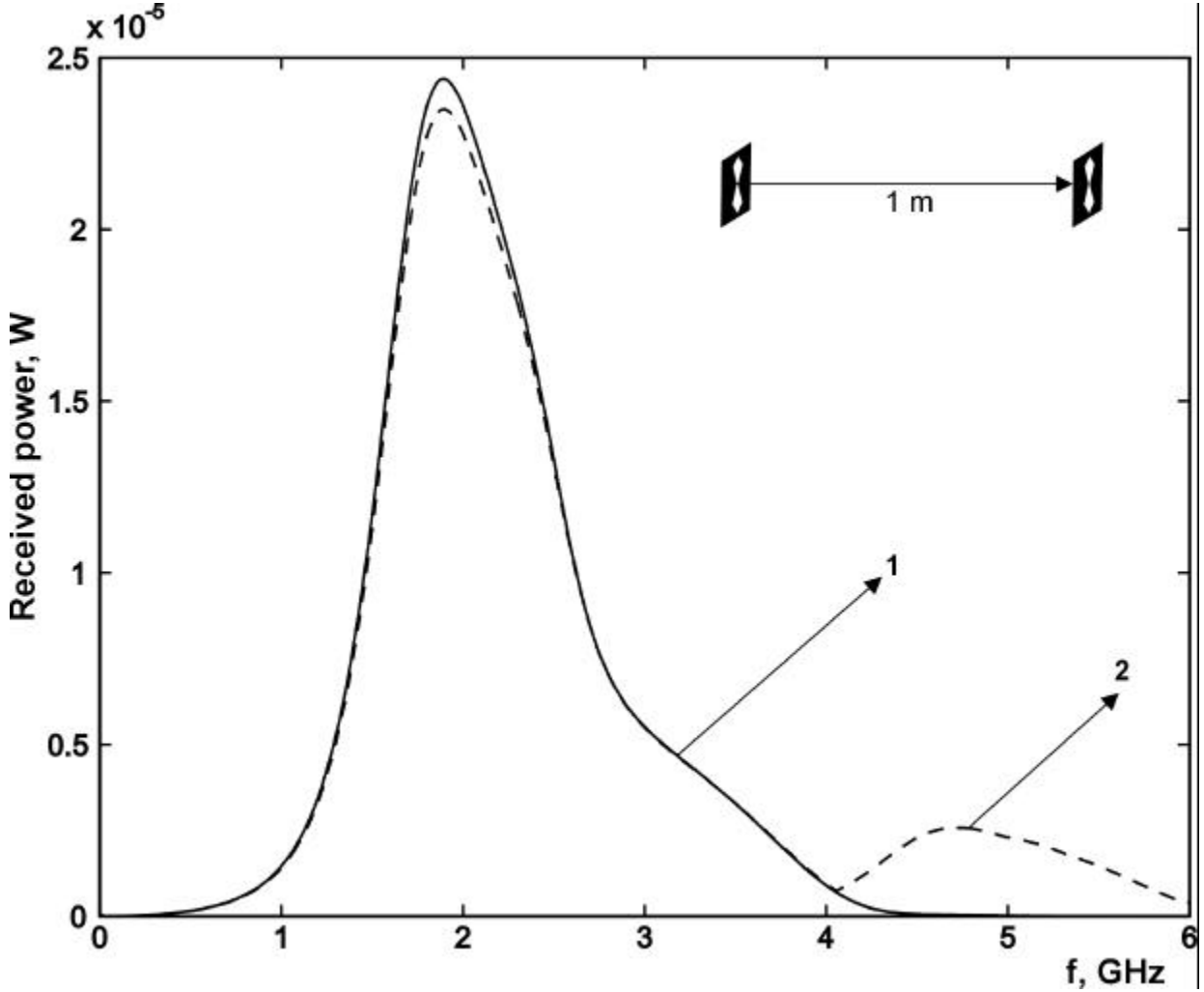
Antenna-to-free-space transfer function



Radiated electric field (the y-component) as a function of frequency at a distance of 1 m from the transmitting antenna: a) – magnitude; b) – phase.

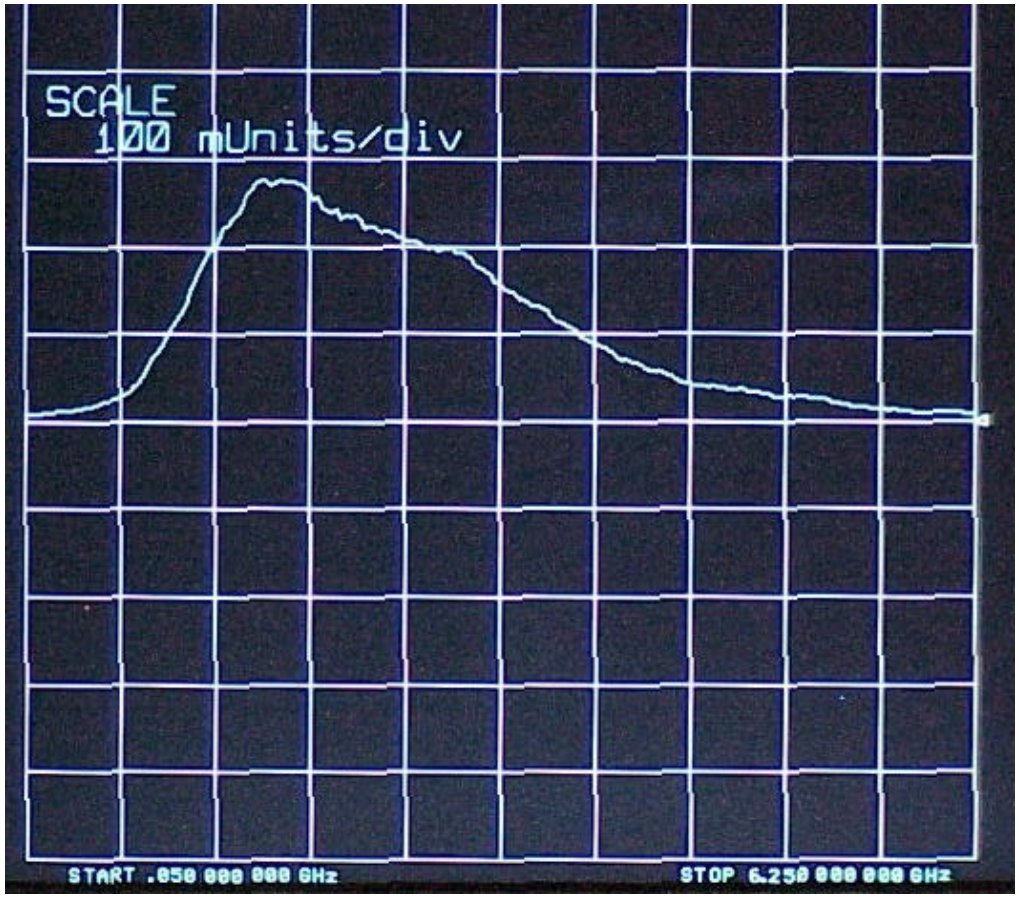
Antenna-to-antenna transfer function

Total power received by the second antenna as a function of frequency (power spectrum of the antenna-to-antenna transfer function). 1 – direct power; 2 – Friis transmission formula.



Antenna-to-antenna transfer function-experiment

S21 obtained using Agilent 8722 ET Network analyzer



Transmitted and received pulse of different durations assuming ideal load matching (left) and impedance mismatch (right)