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Block matrix based LU decomposition to analyze kinetic damping in active plasma resonance spectroscopy[1] JAN HENDRIK ROEHL, JENS OBERRATH, Institute of Product and Process Innovation, Leuphana University Lueneburg, Germany — "Active plasma resonance spectroscopy" (APRS) is a widely used diagnostic method to measure plasma parameter like electron density. Measurements with APRS probes in plasmas of a few Pa typically show a broadening of the spectrum due to kinetic effects. To analyze the broadening a general kinetic model in electrostatic approximation based on functional analytic methods has been presented [1]. One of the main results is, that the system response function $Y(\omega)$ is given in terms of the matrix elements of the resolvent of the dynamic operator evaluated for values on the imaginary axis. To determine the response function of a specific probe the resolvent has to be approximated by a huge matrix which is given by a banded block structure. Due to this structure a block based LU decomposition can be implemented. It leads to a solution of $Y(\omega)$ which is given only by products of matrices of the inner block size. This LU decomposition allows to analyze the influence of kinetic effects on the broadening and saves memory and calculation time.
[1] J. Oberrath and R.P. Brinkmann, Plasma Sources Sci. Technol. **23**, 045006 (2014).

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Jens Oberrath
Institute of Product and Process Innovation, Leuphana University Lueneburg, Germany

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