Place:

Hannover, Germany

Title:

Inside Matrix Inversion for TPA: How to prove if regularization is really needed!

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Abstract:

Source characterization by means of a Matrix Inversion Method (MIM) is very often an ill-posed problem: the solution can be very sensitive to small perturbations in the measured data. In general, the condition number of the matrix (ratio of smallest and highest singular value) is taken as an indicator of how ill-posed the problem is: The solution is more sensitive for higher condition numbers. The range of the condition number is between one and infinity. There are no clear suggestions for a maximum condition number that should not be exceeded for a given matrix.

The application of regularization techniques for the treatment of ill-conditioned matrices leads to smaller condition numbers. However, regularization is based on reducing the contributions to the solution from the smallest singular values. This can lead to a loss of physically important information. Therefore, the principle "the smaller the better" does not work here straightforwardly.

In this paper we present an extended analysis of the problem, taking into account the matrix itself and the physics of the given application example.