In this contribution, we consider the problem of determining the so-called information content of the field radiated by an electric or magnetic current. As is well known, this is related to the Number of Degrees of Freedom (NDF) of the field which, in turn, is a critical figure in the framework of inverse source problem as it dictates the trade-off between accuracy and stability. In particular, here the focus is on establishing a relationship between NDF and the geometrical parameters relevant for the problem (extent of the observation domain, where the field is assumed to be collected, and the source extent).

In detail, the study is conducted by analyzing the spectrum of the involved radiation operators. Accordingly, the number of relevant parameters, i.e., NDF, turns to be related to the number of significant (i.e., above a fixed generally noise dependent threshold) singular values. For the sake of simplicity, the analysis is performed for a 2D geometry where both the source and the observation domains are rectilinear and located in the "not reactive" near zone.

A number of results are shown.

First, it is shown that for both cases (i.e., for electric as well as magnetic sources) singular values exhibit an abrupt decay in correspondence to a certain index. This is because the relevant kernel can be approximated by an exponential type function. For this reason, the number of singular values to be retained in a regularized reconstruction scheme is essentially finite and weakly dependent on the noise level, even for unbounded observation domain. This permits to identify the NDF as the number of singular values before the asymptotic decay, we were able to link to the geometrical parameters discussed above.

Second, by comparing the case of electric and the magnetic sources, it is shown that, fixed the geometrical parameters, the singular values of the magnetic case are always below those of the electric current. This means that electric inverse source problems are generally more stable.

Finally, it is show that, due to the particular mathematical features of the operator involved in the electric case, singular functions of low index do not any longer have low spectral contents. In other words, as the index increases, singular functions become less oscillating.