

## Appunti di Fisica '24

**14 novembre ore 15:00**

Sala Seminari, CNR-IPCF

### Notes on a couple of non linear inverse problems in applied electromagnetics

#### Tommaso Isernia

(Dip. di Ingegneria dell'Informazione, delle infrastrutture e dell'Energia Sostenibile,  
Università Mediterranea di Reggio Calabria)

The capability of quantitatively recovering the electromagnetic characteristics of objects (including their spatial distribution) from the field they scatter has a multiplicity of applications ranging from biomedical imaging to humanitarian demining. In a similar fashion, the so called 'phase retrieval problem' where one wants to retrieve a complex signal from its amplitude (plus something) has very many applications in optics, X-ray cristallography, antennas, and many more.

Notably, besides their relevance in reconstruction problems, in both cases solving in an effective fashion the problem at hand can allow very powerful 'inverse design' procedures, so that one can synthesize primary sources and scatterers in such a way to achieve fields with pre-determined characteristics (for example, in the design of metamaterials based devices).

On the other side, both problems are non linear and ill-posed, so that particular caution has to be taken in avoiding 'false' (or suboptimal) solutions.

The seminar will report on some effective approaches developed at the LEMMA group in Reggio Calabria together with IREA/CNR (Napoli) to tackle non linearity of the two problems at hand in the most effective fashion.