**Spin- and angle- resolved photoemission (Spin-ARPES) as a tool for understanding the electronic and spin properties of quantum materials**

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Photoemission with angular and spin resolution (Spin-ARPES) provides direct access to the electronic band structure and spin texture of crystalline materials [1]. Its development has been closely intertwined with, and driven by, advances in quantum materials. In this lecture, I will introduce the fundamental principles of Spin-ARPES and illustrate its role in elucidating electronic properties and correlation effects in quantum materials.
I will then present the experimental setup at the APE-LE beamline at Elettra, Triste, where a unique combination of Spin-ARPES and variable-polarization synchrotron radiation has been implemented [2] (see also https://www.elettra.eu/elettra-beamlines/ape.html). This approach has enabled a wide range of experiments aimed at uncovering the electronic and spin properties of novel low-dimensional and topological materials, correlated oxides, kagome metals, altermagnets, and two-dimensional (2D) heterostructures (some recent results are included in [3–6]).
Finally, in the context of the new Elettra 2.0 synchrotron, I will introduce the future APE-ELE beamline. This new facility will feature an extended energy range and a next-generation experimental station, where high energy and momentum resolution Spin-ARPES will be combined with a micro-focused beam spot. This configuration will be particularly well suited for the investigation of small single crystals and 2D heterostructures, which are increasingly central to current research efforts.

**References:**

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