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## Proposta di Tesi di Dottorato UniFI

**Title – *Super-Resolution in Astronomy: Development and Tests of Technologies for the Microwave Range***

**Supervisor** – Luca Olmi, INAF – Osservatorio Astrofisico di Arcetri,  
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**Description** – The concept of Super-Resolution (SR) refers to various methods for improving the angular resolution of an optical imaging system beyond the classical diffraction limit. In optical microscopy several SR techniques have been successfully developed. In Astronomy, however, microscopy techniques cannot be applied. Several proposals have been suggested during the past ~15-20 years, but none of them has yet led to a working SR device/technique for *astronomical imaging*. A feasible method to achieve SR with single-dish telescopes is to use variable transmittance/reflectance pupils. The Osservatorio di Arcetri is currently engaged in a project to develop a working SR optical module or technique to implement on the Sardinia radio telescope (SRT) and the other national radio telescopes.

The activities that the student will have to carry out during the doctoral project include the following:

1. Optical/EM design and optimization of an improved optical system to implement SR based on a test satellite antenna.
2. Comparison of systems based on transmissive and reflective elements.
3. Laboratory and field tests of a practical prototype.
4. Extension of optical/EM design to the SRT.

A basic knowledge of Astronomical Optics and/or antenna fundamentals would be an advantage, but it is not strictly required. The student will receive an initial training at Arcetri as well as at other national facilities. Further expertise could be acquired through specific courses. The student will become acquainted with radioastronomical methods and technologies, optical/EM modeling and design and laboratory microwave testing.