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Osservazioni HI nell'era SKA per testare modelli di materia oscura e teorie alternative

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"The 21-cm line of atomic hydrogen (HI) is one the best tools to study the properties of dark matter (DM) halos around galaxies because HI disks are generally regularly rotating and more extended than the stellar components of galaxies, so they trace the gravitational potential in the outermost DM-dominated regions. Indeed, extended HI rotation curves played a key historical role to establish the DM problem in the first place.

In this context, the SPARC (Surface Photometry and Accurate Rotation Curves) project has been an important step because it has provided the community with HI rotation curves and NIR surface photometry for 175 disk galaxies at z=0 (Lelli et al. 2016). I will review the main results from the SPARC project, such as the properties of DM halos and the empirical scaling laws of disk galaxies. I will also highlight current drawbacks, such as data heterogeneity and limited statistics, which affects our ability of testing LCDM models and alternative gravitational theories.

Next, I will introduce the BIG-SPARC project (Haubner et al. in prep.), which is studying about 4000 galaxies with HI data from SKA pathfinders (APERTIF, ASKAP, ATCA, GMRT, VLA) and NIR photometry from WISE. BIG-SPARC increases the sample size of its predecessor by more than a factor of 20, allowing us to study galaxy dynamics with unprecedented statistics. BIG-SPARC, however, is just an intermediate step to get ready to the additional order-of-magnitude increase in sample sizes expected from on-going HI surveys with SKA pathfinders and ultimately with SKA-mid."

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