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Searching for Dark Matter with Vertically-Aligned Carbon Nanotubes: the ANDROMeDa Project

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We present the latest results from the ANDROMeDa (Aligned Nanotube Detector for Research On MeV Dark-matter) project, which was funded with 1MEur PRIN grant by the italian Ministry of Research (MUR). The main objective of ANDROMeDa is the development of the Dark-PMT, a novel light Dark Matter (DM) detector based on vertically-aligned carbon nanotubes. The detection scheme is based on DM-electron scattering inside a target made of vertically-aligned carbon nanotubes. Carbon nanotubes are made of wrapped sheets of graphene, which is a 2-dimensional meterial: therefore, if enough energy is transferred to overcome the carbon work function, the electrons are emitted directly in the infra-tube vacuum. If the ejected electrons are capable of leaving the target without being re-absorbed, they can then be detected by an external electron detector. Vertically-aligned carbon nanotubes have reduced density in the direction of the tube axes, and have been shown to channel Ar+ ions along the whole length (200 μm) of the tubes. Transmission properties of electrons traveling parallel to the nanotubes still hasn't been observed experimentally, and is one of the main aims of the R&D of this project.

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