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HERD: an innovative detector to expand energy limits in direct detection of cosmic rays

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The HERD (High Energy cosmic-Radiation Detection facility) experiment is a future experiment for the direct detection of high energy cosmic rays that will be installed on the Chinese space station in 2027. It is constituted by an innovative calorimeter built by about 7500 LYSO scintillating crystals of side 3 cm assembled in a spheroidal shape, such that it has an homogeneous response for particle entering in the calorimeter from every direction. It is surrounded on five faces by multiple sub-detectors, so that he can detect particles entering from five sides. Thanks to this innovative geometry, HERD will have a geometric factor more than one order of magnitude bigger than that of

current in orbit experiments, which detect particles only form one side. Thus, HERD will extend direct measurements of cosmic rays of more than one order of magnitude in energy. Indeed, it will measure proton and nuclei fluxes up to the PeV/nucleon energy region, performing the first direct measurement of the cosmic proton and Helium knee. Moreover, HERD will measure the electron+positron flux up to tens of TeV, looking for possible indirect signals of dark matter and possible local sources of high energy electrons/positrons. In addition, HERD will measure high energy photon flux to search for possible indirect signals of dark matter, high energy cosmic rays sources and perform multi-messenger astronomy.

In this talk we would like to introduce the HERD experiment, with its scientific objectives and its innovative detector.

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