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The SIDDHARTA-2 Apparatus for Kaonic Deuterium X-Ray Spectroscopy at DAFNE

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Kaonic atoms provide a perfect testing ground for studying the low-energetic, non-perturbative regime of quantum chromodynamics. Since kaons are the lightest mesons carrying strangeness, they allow for a direct observation of the influence of the strong interaction on the kaonic atom ground state in the form of an induced energy shift and broadened width. The SIDDHARTA-2 experiment, located at the DAFNE collider in Frascati, Italy, aims to determine this ground state shift and width in kaonic deuterium via X-ray spectroscopy. Due to the very low kaonic deuterium X-ray yield, an improvement of the signal-to-background ratio of at least one order of magnitude is vital for the success of this measurement. This increase will be achieved in SIDDHARTA-2 through the implementation of three updates on the apparatus: a lightweight, cryogenic gaseous target cell, a large-area X-ray detection system in the form of Silicon Drift Detectors, and a veto system dedicated to background suppression. The veto system consists of the Veto-1 system for active shielding and the Veto-2 system for the discrimination against background originating from minimum ionising particles. The properties and characterisation of these updates will be presented.

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