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Dark Matter Searches at LNF with the PADME detector

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The evidence of dark matter so far is based only on gravitational effects observed at cosmological level. To explain these effects, many theoretical models suggest other non-gravitational very-weak interactions between dark matter and ordinary matter. To test this hypothesis, different experiments are trying to directly produce dark matter at particle accelerators.
The Positron Annihilation into Dark Matter Experiment (PADME), ongoing at the Laboratori Nazionali di Frascati of INFN, is looking for signals of hidden particles by studying positron-electron annihilations.
The experiment was built and commissioned at the end of 2018 and collected $\approx 5 \times 10^{12}$ positrons on target in two distinct run periods.
The dark photon signal is searched studying the reaction $e^+e^- \rightarrow \gamma A'$ and evaluating the missing-mass spectrum of single photon final states. This requires a precise calibration of the experimental setup that has been performed evaluating the cross section of the process $e^+e^- \rightarrow \gamma\gamma(\gamma)$ at $\sqrt{s}$= 20 MeV. The obtained results is the most precise determination of this physics quantity ever done, at it shows a good agreement with NLO-QED predictions.
In 2022 PADME had also a new data taking to study "X17 anomaly", a tricky phenomenon observed by the Atomki collaboration of Debrecem in the de-excitation via internal-pair-creation of some light nuclear systems (i.e. ^8Be, ^4He, ^{12}C). PADME owns the unique opportunity to test the particle hypothesis of such anomaly. Therefore, with a slightly modifying experimental setup, a dedicated data taking was performed. In the talk the details of the ongoing analyses will be presented.

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