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The X-rays detector system of the FAMU Experiment for the measurement of the muon transfer rate to carbon

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The study of the properties of the proton is based on spectroscopy measurements. The FAMU experiment aims to measure the Zemach radius of the proton through exotic atoms. In particular the hyperfine splitting (HFS) of the energy ground levels of the muonic hydrogen (μp) is directly related to the Zemach radius. In presence of a gas mixture, muons are transferred from μp to heavier gas with energy-dependent rate resulting also in a higher rate of X-rays. An efficient and fast detector system is required for such a precise measurement. The experiment is based on $\text{LaBr}_3(\text{Ce})$ fast timing X-rays detectors read by PMTs.

Performances of the detector system had been analyzed in order to obtain the measurement of the muon transfer rate to carbon and they are presented here.

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