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## Monte Carlo studies of $\mu p$ diffusion for the hyperfine-splitting experiment at PSI

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Spectroscopy of muonic hydrogen ( $\mu p$ ) atoms allows for precise investigations of the proton's electromagnetic structure. At PSI we want to measure the groundstate hyperfine-splitting of muonic hydrogen, from which the Zemach radius of the proton can be deduced. The experiment will use a new detection scheme which is based on the diffusion of laser-excited  $\mu p$  atoms inside a gas cell filled with  $H_2$ . Monte Carlo simulations of the  $\mu p$  diffusion process help to develop constraints on various parameters of the experimental setup and to estimate the sensitivity of the measurement. This poster presents the detection scheme of the hyperfine-splitting experiment and outlines the deployed Monte Carlo diffusion studies.

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