Lepton mass effects in elastic lepton-proton scattering beyond the leading order of QED[1] OLEKSANDR KOSHCHII, ANDREI AFANASEV, George Washington University — The future MUSE experiment [1] is devised to solve the Proton Radius Puzzle by considering simultaneously elastic $e^{\pm}p$ and $\mu^{\pm}p$ scattering. This experiment requires a per cent level accuracy in comparison of electron-proton and muon-proton scattering. Our goal is to provide all the relevant radiative corrections calculations for MUSE without using ultrarelativistic ($m_l \to 0$) approximation. This approximation is not applicable for the scattering of muons in kinematics of MUSE. In this talk, we will present our up-to-date results on radiative corrections calculations obtained by using a Monte Carlo generator ELRADGEN [2] modified to treat the lepton mass effects with no ultra-relativistic approximation. Next, we will discuss our estimations of the important helicity-flip contribution represented by a scalar σ meson exchange in the t-channel [3]. This term vanishes in the ultra-relativistic and/or one-photon exchange approximation, and makes a difference in comparison of electron vs muon scattering in MUSE. [1] R. Gilman, E. J. Downie, G. Ron, et al. (MUSE Collab.), e-print arXiv:1303.2160. [2] I. Akushevich, O.F. Filoti, A. Ilyichev, N. Shumeiko, Comp. Phys. Comm. 183, 1448 (2012) [3] O.Koshchii, A.Afanasev, e-print arXiv:1608.01991

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