The ^{3}He structure from the proton-^{3}He backward elastic scattering at intermediate energy

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We provide systematic analysis of the proton-^{3}He elastic scattering at $\theta_{\rm cm} = 180°$. For the first time energy dependence of the differential cross section is quantitatively described. It is shown that there are three kinematical regions where different mechanisms determine the reaction: up to T_p =200 MeV the one deuteron exchange (ODE) is dominated; between 200< T_p <1000 MeV the reaction is determined by rescattering of intermediate pion off the intermediate deuteron (PI), and at higher energies the dominating mechanism should be the direct scattering of the beam proton on the proton from ^{3}He (DIR). The same must be true also for other backward scattering reactions with the lightest nuclei at intermediate energy.

It is demonstrated that all the mechanisms, ODE, DIR and PI, are deeply connected with the ^{3}He structure at short distances. For example, it is shown, that the differential cross section and polarization observables depend strongly on the 3N force.

The predictions for the cross section and the spin-spin correlation C_{yy} at energy $T_p < 1$ GeV are given. Some of predictions of this model can be studied experimentally at RCNP Ring Cyclotron.