This fact has motivated the subsequent step of introducing a repulsive term in the model. As a simple choice, we have introduced a purely central E-term and a corresponding $Z_0(r)$ function, obtained using the monopole cutoff of the model. Including this term we were able to describe simultaneously $B(^3\mathrm{H})$ and ${}^2a_{nd}$ for several values of the cutoff. A further selection among these values has been done from the calculation of $B(^4\mathrm{He})$. We have observed that with $\Lambda \leq 4.8\, m_\pi$ it was possible to describe the three quantities reasonably well.

In the original AV18+URIX model the relative strength between the b- and d-terms was fixed. In the present analysis we have relaxed this condition increasing the number of parameter of the model from two to three, the strengths of the b-, d- and E-terms. Varying them, we have found it possible to describe the three quantities of interest for values of the parameters very different from their original ones. In particular, the strength of the repulsive term resulted more than three times larger than the original value. In the case of the AV18+N2LOL model, maintaining the strength of the a-term fixed to its original value, we have varied the parameters c_3, c_4, c_D and c_E in combinations that reproduce $B(^3\mathrm{H})$. Then we have studied the dependence on ${}^2a_{nd}$ and $B(^4\mathrm{He})$ of the different parametrizations. For fixed values of c_E we have calculated ${}^2a_{nd}$ for different values of c_3 and c_D. We have found that $c_3 \geq 1.4 c_3^0$ in order to describe simultaneously $B(^3\mathrm{H})$ and ${}^2a_{nd}$. The values of c_D has been selected from the analysis of $B(^4\mathrm{He})$. Values of $B(^4\mathrm{He})$ compatible with the experimental value have been found in the four cases of c_E explored.

After making this sensitivity study we have selected, for each model, some combinations of the parameters that give the better description of $B(^3\mathrm{H})$, ${}^2a_{nd}$ and $B(^4\mathrm{He})$ and we have calculated the differential cross section and the vector and tensor analyzing powers at $E_{lab} =$ 3 MeV. At this energy there are well established discrepancies between the predictions of the theoretical models and the experimental results. For example all potential models underestimate A_y (the so-called A_y puzzle) and iT_{11} and overestimate the central minimum in T_{21}. Some TNF models have been constructed *ad hoc* to improve the description of these observables at low energy [27]. However the models studied here, derived from the exchange of two pions and contact terms, are not able to solve these discrepancies. What we have observed in the present study is that after fixing the parameters of each model from the description of $B(^3\mathrm{H})$, ${}^2a_{nd}$ and $B(^4\mathrm{He})$, the description of the vector polarization observables lies in a narrow band, positioned differently for each model. The best description is given by the AV18+N2LOL model which, with respect to the original AV18+URIX model, reduces