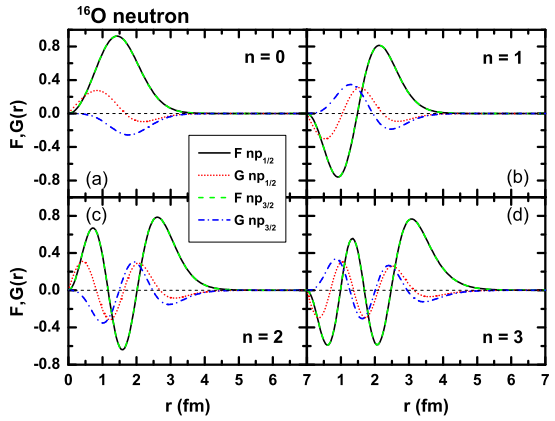

FIG. 2: (color online) Radial Dirac wave functions of the spin doublets p orbits in the negative energy spectrum of ^{16}O calculated by DDRHF with PKO1. Panels (a), (b), (c), and (d) are for $0p$, $1p$, $2p$, and $3p$ spin doublets, respectively.

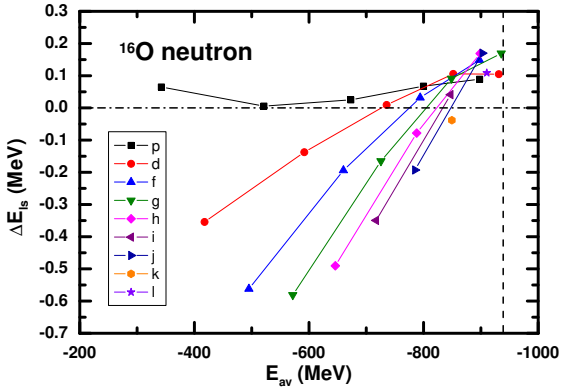

FIG. 3: (color online) Spin-orbit splitting $\Delta E_{\rm ls} = E_{n\tilde{l}_{\tilde{l}+1/2}} - E_{n\tilde{l}_{\tilde{l}-1/2}}$ in the negative energy spectrum of ^{16}O versus the average binding energy $E_{\rm av} = (E_{n\tilde{l}_{\tilde{l}+1/2}} + E_{n\tilde{l}_{\tilde{l}-1/2}})/2$ calculated by DDRHF with PKO1. The vertical dashed line shows the continuum limit.

comparison with the RMF results (see Fig. 2 in Ref. [15]), the DDRHF results have the following characteristics: 1) the spin-orbit splittings are smaller; 2) the spin-orbit splittings fluctuate with $E_{\rm av}$, in contrast with the monotonous decreasing in the RMF case, when approaching the continuum limit; 3) in RMF the spin-down state ($j = \tilde{l} - 1/2$) is always lower than its spin-up partner ($j = \tilde{l} + 1/2$), while in DDRHF this occurs only for the p orbits and states near the continuum limit.

In order to understand the origin of the spin symmetry in DDRHF and the relative positions of the spin-up state and its spin-down partner, the effective potentials V in Eq.