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THE MATRIX–ELEMENTS OF TWO–PARTICLE RESIDUAL INTERACTION IN THE SHELL–MODEL FORMALISM WITH THE M.S.D.I. APPROXIMATION

PART II

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THE MATRIX-ELEMENTS OF TWO-PARTICLE RESIDUAL INTERACTION IN THE SHELL-MODEL FORMALISM WITH THE M.S.D.I. APPROXIMATION

Part II

ELEMENTY MACIERZOWE DWUCZĄSTKOWEGO ODDZIAŁYWANIA RESZTKOWEGO TYPU DELTA /M.S.D.I./ OBLICZONE NA BAZIE MODELU POWŁOKOWEGO Część II

МАТРИЧНЫЕ ЭЛЕМЕНТЫ ДВУХЧАСТИЧНОГО ОСТАТОЧНОГО ВЗАИМОДЕЙСТВИЯ ТИПА "ДЕЛЬТА" ВЫЧИСЛЕННЫЕ НА БАЗЕ МОДЕЛИ ОБОЛОЧОК

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The table of two-particle matrix elements calculated according the formalism of MSDI approximation for the orbits $1f_{7/2}$, $2p_{3/2}$, $2p_{1/2}$ and $1f_{5/2}$ and published previously is now supplemented by inclusion of the $1g_{9/2}$ orbit.

Tablica dwucząstkowych elementów macierzowych obliczonych przy założeniu oddziaływania typu "delta" dla orbit $1f_{7/2}$, $2p_{3/2}$, $2p_{1/2}$ i $1f_{5/2}$ i opublikowana poprzednio została obecnie rozszerzona przez włączenie orbity $1f_{9/2}$.

Представляется продолжение опубликованной ранее таблицы двучастичных, матричных элементов рассчитанных в приближения поверхностного взаимодействия типа "дельта" для орбит $1f_{7/2}$, $2p_{3/2}$, $2p_{1/2}$ и $1f_{5/2}$ включая дополнительно орбиту $1g_{9/2}$.

In the previous paper /1/ we published the numerical values of the two-particle matrix-elements calculated according to the formalism of the MSDI approximation. These calculation covered the whole basis of the Pauli allowed states for two nucleon distributed in the $1f_{7/2}$, $2p_{3/2}$, $2p_{1/2}$ and $1f_{5/2}$ orbits outside the ^{40}Ca core. In the recent few years some authors /2,3,4/ have shown that inclusion of the $1g_{9/2}$ orbit to the shell-model calculations reproduces better the experimental values of various observables such as the energy levels, spectroscopic factors, multipole moments and electromagnetic transition rates.

Therefore we decided to supplement the calculations including the $1g_{9/2}$ orbit in order to prove the validity of MSDI residual interaction in describing the properties of the $1f_{7/2}$ shell nuclei, when the configuration space is extended to five orbits: $1f_{7/2}$, $2p_{3/2}$, $2p_{1/2}$, $1f_{5/2}$, $1g_{9/2}$.

The present paper presents the numerical values of diagonal and off-diagonal two-particle matrix-elements describing this interaction. They are calculated according the formula (3) given in the previous paper /1/.

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	⟨AB|V|CD⟩
4	9	1	1	3	5	1	3	4	0	−1.1270
								4	1	+1.1268
4	9	1	1	3	5	3	5	5	0	+2.0965
								4	1	+0.3253
4	9	1	1	3	7	1	1	4	0	+0.9938
								4	1	+0.9938
4	9	1	1	3	7	1	3	4	0	+0.3361
								5	0	−0.2099
								4	1	+0.8399
								5	1	0.0000
4	9	1	1	3	7	3	5	4	0	+1.0636
								5	0	+0.6498
								4	1	−0.7597
								5	1	0.0000
4	9	1	1	3	7	3	7	5	0	−0.3206
								4	1	+0.7207
4	9	1	1	4	9	1	1	4	0	−2.0000
								5	0	−1.0910
								4	1	0.0000
								5	1	−0.9096
4	9	1	3	1	3	1	3	3	0	−1.9795
4	9	1	3	3	5	1	1	3	0	0.0000
								3	1	0.0000
4	9	1	3	3	5	1	3	3	0	+0.8571
								4	0	−1.1695
								3	1	0.0000
								4	1	−0.6796
4	9	1	3	3	5	3	5	3	0	+0.3300
								5	0	−0.5051
								4	1	−0.1962
4	9	1	3	3	7	1	1	3	0	−2.5620
								4	0	+1.0487
								3	1	0.0000
								4	1	−0.5995

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	$\langle AB \| V \| CD \rangle$
4	9	1	3	3	7	1	3	3	0	-2.1200
								4	0	+0.3361
								5	0	+0.4941
								3	1	0.0000
								4	1	-0.5065
								5	1	0.0000
4	9	1	3	3	7	3	5	3	0	+1.8443
								4	0	+1.0636
								5	0	-0.3954
								6	0	+1.5475
								3	1	0.0000
								4	1	-0.4582
								5	1	0.0000
								6	1	+0.5710
4	9	1	3	3	7	3	7	3	0	-1.6343
								5	0	-0.7671
								4	1	-0.4346
								6	1	+0.5410
4	9	1	3	4	9	1	1	4	0	-0.2051
								5	0	+0.4453
								4	1	0.0000
								5	1	+0.7424
4	9	1	3	4	9	1	3	3	0	-1.4285
								4	0	-1.3939
								5	0	-0.1818
								6	0	-2.7272
								3	1	-1.9048
								4	1	0.0000
								5	1	-0.6060
								6	1	0.0000
4	9	3	5	1	3	1	1	2	0	+1.5119
								2	1	-1.5119
4	9	3	5	1	3	1	3	3	0	+1.3400
								2	1	-1.5117

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	⟨AB|V|CD⟩
4	9	3	5	3	5	1	1	2	0	−1.2345
								3	0	+0.7864
								2	1	+1.8511
								3	1	0.0000
4	9	3	5	3	5	1	3	2	0	−1.6495
								3	0	−0.1407
								4	0	+0.5441
								2	1	−0.9895
								3	1	0.0000
								4	1	+1.0892
4	9	3	5	3	5	3	5	3	0	−0.7310
								5	0	−1.8855
								2	1	+1.3997
								4	1	+0.3147
4	9	3	5	3	7	1	1	3	0	+1.6330
								4	0	−0.4807
								3	1	0.0000
								4	1	+0.9613
4	9	3	5	3	7	1	3	2	0	−1.6162
								3	0	+1.5727
								4	0	−1.6245
								5	0	+0.4941
								2	1	+2.4242
								3	1	0.0000
								4	1	+0.8122
								5	1	0.0000
4	9	3	5	3	7	3	5	2	0	−1.8856
								3	0	+0.9079
								4	0	−0.5142
								5	0	−0.3954
								6	0	+0.2758
								2	1	+0.8081
								3	1	0.0000
								4	1	−0.7345

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	$\langle AB \| V \| CD \rangle$
4	9	3	5	3	7	3	5	5	1	0.0000
								6	1	+0.8274
4	9	3	5	3	7	3	7	3	0	+1.2747
								5	0	+0.4641
								7	0	+1.7093
								2	1	+1.6493
								4	1	+0.6969
								6	1	−0.3379
4	9	3	5	4	9	1	1	4	0	−0.6445
								5	0	−1.1410
								4	1	0.0000
								5	1	+0.7131
4	9	3	5	4	9	1	3	3	0	+1.1183
								4	0	+1.1015
								5	0	−0.4658
								6	0	+1.0465
								3	1	+0.7034
								4	1	0.0000
								5	1	−0.5823
								6	1	0.0000
4	9	3	5	4	9	3	5	2	0	−4.7616
								3	0	−1.3863
								4	0	−1.2467
								5	0	−1.1935
								6	0	−0.5360
								7	0	+1.6783
								2	1	0.0000
								3	1	−0.2597
								4	1	0.0000
								5	1	−0.5595
								6	1	0.0000
								7	1	−1.4685
4	9	3	7	1	1	1	1	1	0	0.0000

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	⟨AB|V|CD⟩
4	9	3	7	1	3	1	1	1	0	-1.2170
								2	0	-1.6749
								1	1	0.0000
								2	1	+0.3722
4	9	3	7	1	3	1	3	1	0	+2.3094
								3	0	+1.1935
								2	1	-0.2632
4	9	3	7	3	5	1	1	2	0	+1.3667
								3	0	-0.7705
								2	1	-0.4558
								3	1	0.0000
4	9	3	7	3	5	1	3	1	0	+4.8985
								2	0	+1.8273
								3	0	-0.9477
								4	0	+1.4430
								1	1	0.0000
								2	1	+0.2437
								3	1	0.0000
								4	1	+0.6411
4	9	3	7	3	5	3	5	1	0	-1.2341
								3	0	+0.2985
								5	0	-1.4231
								2	1	+0.3446
								4	1	+0.1851
4	9	3	7	3	7	1	1	3	0	+1.6682
								4	0	-1.2723
								3	1	0.0000
								4	1	+0.5656
4	9	3	7	3	7	1	3	2	0	+1.7905
								3	0	+1.1558
								4	0	-0.4301
								5	0	-0.6051
								2	1	-0.5969
								3	1	0.0000

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	$\langle AB\|V\|CD\rangle$
4	9	3	7	3	7	1	3	4	1	+0.4778
								5	1	0.0000
4	9	3	7	3	7	3	5	1	0	-5.8585
								2	0	+1.8900
								3	0	-1.4458
								4	0	-1.3935
								5	0	-0.6161
								6	0	+1.4333
								1	1	0.0000
								2	1	-1.1989
								3	1	0.0000
								4	1	-0.4323
								5	1	0.0000
								6	1	-0.9556
4	9	3	7	3	7	3	7	1	0	+2.6569
								3	0	+0.8214
								5	0	-0.2341
								7	0	+1.2686
								2	1	-0.4061
								4	1	+0.4101
								6	1	+0.3900
4	9	3	7	4	9	1	1	4	0	+0.5057
								5	0	+0.3495
								4	1	0.0000
								5	1	+0.8736
4	9	3	7	4	9	1	3	3	0	+0.4307
								4	0	+1.5820
								5	0	-0.1426
								6	0	-2.2660
								3	1	+1.7230
								4	1	0.0000
								5	1	-0.7137
								6	1	0.0000

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	⟨AB|V|CD⟩
4	9	3	7	4	9	3	5	2	0	-2.8135
								3	0	-0.4242
								4	0	-1.1613
								5	0	-0.3654
								6	0	+0.8750
								7	0	+0.1142
								2	1	0.0000
								3	1	-0.6362
								4	1	-0.4323
								5	1	-0.6854
								6	1	0.0000
								7	1	+0.7994
4	9	3	7	4	9	3	7	1	0	-2.2222
								2	0	-2.5108
								3	0	-0.1300
								4	0	-1.8163
								5	0	-0.1119
								6	0	-1.9114
								7	0	-0.0077
								8	0	-3.4225
								1	1	-4.4444
								2	1	0.0000
								3	1	-1.5586
								4	1	+0.4101
								5	1	-0.8392
								6	1	0.0000
								7	1	-0.4351
								8	1	0.0000
4	9	4	9	1	1	1	1	1	0	+1.4277
								0	1	-2.2360
4	9	4	9	1	3	1	1	1	0	-2.0946
								2	1	-0.9847

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	$\langle AB \| V \| CD \rangle$
4	9	4	9	1	3	1	3	1	0	−1.5595
								3	0	−0.5795
								0	1	−2.2361
								2	1	−0.6965
4	9	4	9	3	5	1	1	3	0	−1.3890
								2	1	−1.2060
4	9	4	9	3	5	1	3	1	0	−1.3927
								3	0	−0.5257
								2	1	−0.6447
								4	1	−0.8481
4	9	4	9	3	5	3	5	1	0	+2.0395
								3	0	+0.9934
								5	0	−0.1740
								0	1	−3.8730
								2	1	+0.9118
								4	1	−0.2449
4	9	4	9	3	7	1	1	3	0	−0.5552
								4	1	−0.7479
4	9	4	9	3	7	1	3	3	0	−0.7155
								5	0	+1.5128
								2	1	+1.5790
								4	1	+0.6321
4	9	4	9	3	7	3	5	1	0	+1.6642
								3	0	−0.0617
								5	0	+0.4401
								2	1	−0.3723
								4	1	+0.5719
								6	1	+0.7225
4	9	4	9	3	7	3	7	1	0	−2.2084
								3	0	−0.7747
								5	0	+0.9195
								7	0	+1.2686
								0	1	+4.4720
								2	1	+1.0745
								4	1	−0.5425

L_A	$2J_A$	L_B	$2J_B$	L_C	$2J_C$	L_D	$2J_D$	J	T	⟨AB|V|CD⟩
								6	1	+0.2948
4	9	4	9	4	9	1	1	5	0	-0.8736
								4	1	0.0000
4	9	4	9	4	9	1	3	3	0	-1.1941
								5	0	-0.3566
								4	1	0.0000
								6	1	0.0000
4	9	4	9	4	9	3	5	3	0	+1.1765
								5	0	-0.9136
								7	0	-1.0364
								2	1	0.0000
								4	1	0.0000
								6	1	0.0000
4	9	4	9	4	9	3	7	1	0	+2.3685
								3	0	+0.3603
								5	0	-0.2797
								7	0	+0.0705
								2	1	0.0000
								4	1	0.0000
								6	1	0.0000
								8	1	0.0000
4	9	4	9	4	9	4	9	1	0	-2.5758
								3	0	-1.1189
								5	0	-0.9090
								7	0	-0.9955
								9	0	0.0000
								0	1	-5.0000
								2	1	-1.2122
								4	1	-0.6294
								6	1	-0.3730
								8	1	-0.2016

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