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Quadrupole and Hexadecapole Deformations of Light
 Nuclei in the Hartree-Fock Approximation

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We report results relevant to the quadrupole and hexadecapole deformations of some light nuclei, obtained in projected Hartree-Fock (HF) calculations. The HF wavefunctions are expanded in a five major-shell oscillator basis. Details are described elsewhere.¹⁾ No effective charge is used in the calculation. The results are listed in Table I, and are compared to experimental data, where available. The agreement between theory and experiment is in most places good,

except where ^{32}S is concerned. This adds to the evidence which suggests that the low energy structure of ^{32}S cannot be described by one intrinsic state.

References

- 1) H. C. Lee and R. Y. Cusson: Phys. Letters **39B** (1972) 453; Ann. Phys. (in press).

Table I. Theoretical and experimental moments and transition strengths.^{a)}

		^{12}C	^{20}Ne	^{24}Mg	^{28}Si	^{32}S
$2\langle Q_{20} \rangle^b$	th ^c	-16.0	44.1	57.7	-63.4	-57.7
	(ee') ^d	-20.1	61 $\pm$ 3	68 $\pm$ 3	-62 $\pm$ 3	
	(pp') ^e	$\sim$ -24	66 $\pm$ 3	67 $\pm$ 5	-59 $\pm$ 7	$\pm$ 66 $\pm$ 7
	($\alpha\alpha'$) ^f	-12.7 $\pm$ 0.5	46 $\pm$ 2	53.5 $\pm$ 2.4	-47 $\pm$ 2	46 $\pm$ 6
$\langle Q_2 \rangle_{2_1+}$	th	2.66	-6.8	-8.0	9.5	8.0
	Coul. Ex.		-13 $\pm$ 2.5	-12 $\pm$ 2	8.5 $\pm$ 2.5	-10 $\pm$ 3
$B(E2\uparrow)$	th	35.4	221	392	445	418
	lifetime	42 $\pm$ 5	290 $\pm$ 45	420 $\pm$ 40	320 $\pm$ 20	330 $\pm$ 50
$\langle Q_{40} \rangle$	th	13.9	151	56	162	52
	(ee')	25.4	260 $\pm$ 30	65 $\pm$ 20	200 $\pm$ 20	
	(pp')	$\sim$ 24	260 $\pm$ 40	59 $\pm$ 80	270 $\pm$ 120	330 $\pm$ 160
	($\alpha\alpha'$)	11 $\pm$ 1	130 $\pm$ 10	55 $\pm$ 15	110 $\pm$ 10	280 $\pm$ 80
$B(E4\uparrow)$	th	393	2.64 $\times 10^4$	1.15 $\times 10^4$	2.69 $\times 10^4$	260
	(ee')	$\sim$ 460	$\sim$ 4.9 $\times 10^4$	$\lesssim$ 3 $\times 10^4$	$\sim$ 3.0 $\times 10^4$	

a) All quantities in units of e and F; b) $Q_{\lambda\mu} = \sum_{i=1}^Z r_i^\lambda C_{\lambda\mu}(\Omega_i)$, $\langle Q_\lambda \rangle_J = \langle JJ | Q_{\lambda 0} | JJ \rangle$; c) ^{24}Mg and ^{32}S are axially asymmetric; d) all data from the Tohoku-Tokyo collaboration; e) $\beta_2 \sim .5$ for ^{12}C , from O. Mikushiba *et al.*: Nuclear Phys. **A168** (1971) 417; otherwise data from R. de Swinrarski *et al.*: Phys. Rev. Letters **23** (1969) 317; f) all data from Karlsruhe-Heidelberg collaboration.