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LOW LYING MAGNETIC DIPOLE STRENGTH DISTRIBUTION IN ^{176}Hf

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In this study the scissors mode 1^+ states are systematically investigated within the rotational invariant Quasiparticle Random Phase Approximation (QRPA) for ^{176}Hf isotopes We consider the 1^+ vibrations generated by the isovector spin-spin interactions and the isoscalar (h_0) and isovector (h_1) quadrupole type separable forces restoring the broken symmetry by a deformed mean field It has been shown that restoration of the broken rotational symmetry of the Hamiltonian essentially decreases the B(M1) value of the low lying 1^+ states and increases the collectivization of the scissors mode excitations in the spectroscopic energy region Agreement between the calculated mean excitation energies as well as the summed B(M1) value of the scissors mode excitations and the available experimental data of ^{176}Hf is rather good For instance distributions of the calculated B(M1) transition strengths in the ^{176}Hf isotopes with respect to $K^{\pi}=1^+$ excitations is represented in Figure 1 Thus we see that the models which use the Hamiltonian with broken rotational symmetry strongly overestimate the M1 strength at low energy These results indicate an importance of the models which are free from the low energy spurious states The marked differences between the results for 1^+ states calculated in rotational invariant (RI) and non-rotational invariant (NRI) model indicate the importance of the approaches which are free from spurious low energy solutions A separation of the rotational state from the 1^+ states changes somewhat the distribution of the B(M1) strength in the spectroscopic energy region and increases the fragmentation of the scissors mode 1^+ excitations in agreement with the experimental data

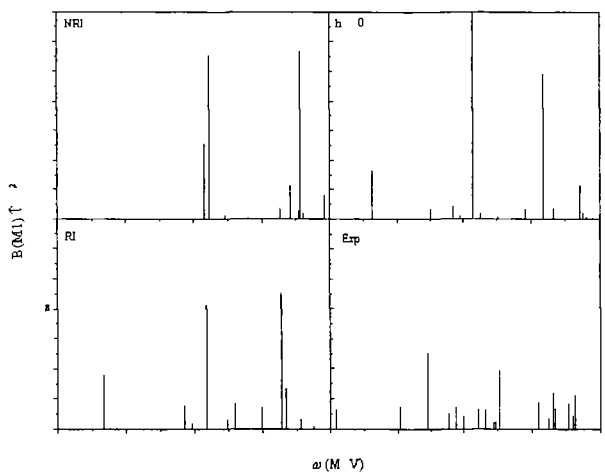

Fig 1 Energy diagram of B(M1) values calculated for ^{176}Hf isotopes in the QRPA using different approximations for the effective forces We present the dipole states with K=0 (dashed line) Only states with $B(M1)\geq 0\,01\,\mu_N^2$ are displayed