Variational Procedure Leading from Davidson Potentials to Critical Point Symmetries

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Abstract

Davidson potentials of the form $\beta^2+\beta_0^4/\beta^2$ are known [1,2] to bridge the U(5) and SO(6) [axial prolate SU(3)] symmetries, leading to the E(5) [X(5)] critical point symmmetries, through a variational procedure in which the rate of change of various physical quantities ($R_4 = E(4)/E(2)$ ratios, for example) is maximized. It is shown that the method also works in the Z(5) [3] and Z(4) frameworks, bridging the limits of vibrator and rigid triaxial rotator, as well as in the framework of the Analytic Quadrupole Octupole Axially symmetric (AQOA) model [4], bridging the limits of vibrator and rigid axial rotator. Several monoparametric curves (curves on which the parameter value is changing along the curve, but are otherwise parameter independent) correlating various physical quantities (the 0_2^+ bandhead to the R_4 ratio [5], for example) are derived and compared to experimental data.

References

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