# Identical energy bands of $^{236}$U and $^{238}$U isotopes by using two parameter formula

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## Introduction

Several explanations were put forward assuming the occurrence of such identical bands to be specific property of superdeformed states of nuclei. Casten et al. [? ] have studied the low spin identical bands in $^{156}$Dy-$^{180}$Os widely dispersed nuclei. A simple correlation exists between the nuclei showing identical spectra and their valence proton ($N_p$), neutron number ($N_n$). Recently supedeformed rotational bands with almost identical energies have been disovered in the mass 150 and 190 regions [? ]-[? ]. The occurrences of identical energy bands which suggest a constant moment of inertia are not expected from general arguments. The $A^{5/3}$ mass dependence, the changes of deformation with mass, the orbital alignment effects, and changes in pairing all seem to be able to produce some changes in moments of inertia. The suppression of these effects has been discussed by Stephens et al. [? ]-[? ]. It was pointed out that the phenomena of identical roatonal band are not restricted to the superdeformed nuclei [? ]. It was shown that in the actinide region many nuclides show identical rotational bands. particularly the ground state rotational bands of $^{236}$U and $^{238}$U are almost identical up to $I = 24$. It was also pointed out that the variation of moment of inertia in the rare-earth region is much less than the rigid body $A^{5/3}$ dependence [? ]. Therefore, the occurrence of identical bands seems to be more common for both superdeformed and normal deformed nuclei than generally expected.

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## Theoretical Calculation

Gupta et al. [? ] suggested a single- term expression for ground band level energies of a soft-rotor. They replaced the concept of the arithmetic mean of the two terms used in the Bohr-Mottelson expression by the geometric mean and introduced a two-parameter formula called the power law

$$E = aJ^b \tag{1}$$

By using Eq.(2) for any spin ($J$) the value of $b$ can be determined from the ratio

$$R_J = E/E(2) = (J/2)^b. \tag{2}$$

## Result and Discussion

The calculated and experimental energy levels of $^{236}$U-$^{238}$U are shown in Figure 1-2. The ground satate bands can be reproduced quite well. This means that the similarities between the moments of inertia of the different uranium isoptopes can be reproduced in general. However, since the values of the moments of inertia depend on the energy gaps senstively. The energy spectra of uranium isotpes were calculated energy levels. Both $^{236}$U and $^{238}$U isotope shows the ground energy state upto $J = 28^+$ for experimental as well as calculated values by using two parameter formula. The ground energy state of $^{236}$U is identical with $^{238}$U.

## Conclusion

The identical ground state energy bands of $^{236}$U and $^{238}$U can be reproduced. Two parameter formula also shows the good agreement with experimental values. The ground energy spectra of these two isotopes are similar to each other.

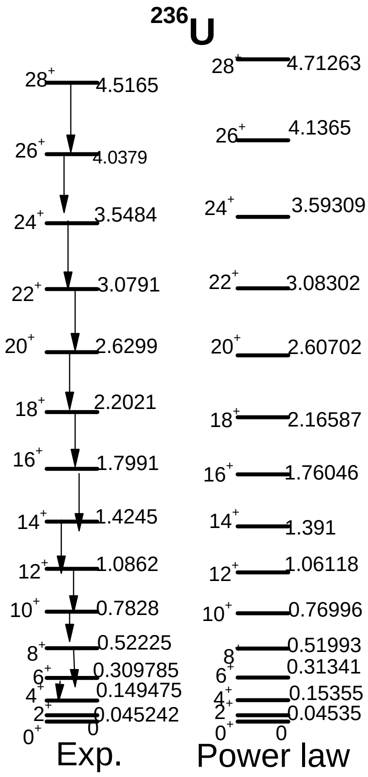


FIG. 1: The experimental and calculated energy levels for $^{236}$U.

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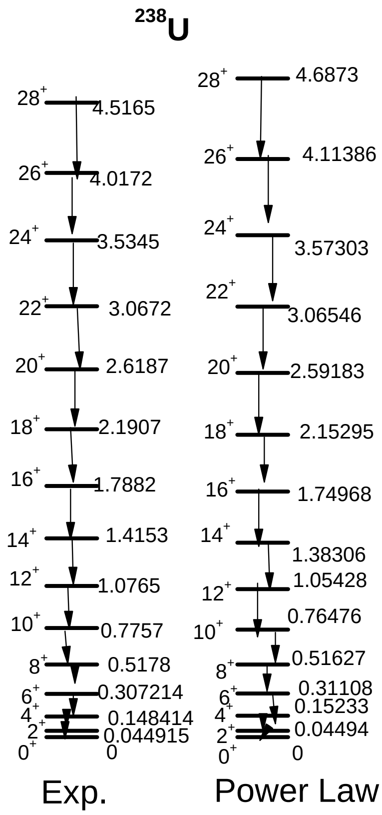


FIG. 2: The experimental and calculated energy levels for $^{238}$U.

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