Table (2). The experimental yrast levels in ^{162}Yb, ^{164}Yb and ^{166}Yb are given along with the calculated energies (method I).

I^{π}		^{162}Yb Exp.(a) (KeV)	^{162}Yb Calc.	^{164}Yb Expt.(b) (KeV)	^{164}Yb Calc.	^{166}Yb Expt.(c) (KeV)	^{166}Yb Calc.	
2	g.b	166.6	129.95	123.3	125.7	102.3	102.45	g.b.
4		487.2	414.70	385.5	398.06	330.2	332.64	
6		923.9	820.72	760.2	780.51	667.9	672.61	
8		1445.2	1311.3	1223.3	1235.60	1097.8	1099.19	
10		2023.6	1856.09	1753.7	1734.89	1605.2	1588.45	
12		2633.5	2434.04	2330.3	2260.84	2175.7	2118.79	
14	s.b	3126.4	3032.9	2899.7	2805.2	2779.0	2672.58	
16		3597.9	3647.4	3389.5	3366.82	3273.2	3236.74	s.b
18		4148.1	4277.6	3932.7	3950.27	3782.0	3803.83	
20		4820.9	4928.0	4566.0	4565.8	4370.0	4376.01	
22		5583.2	5607.3	5278.5	5231.26	5038.0	4979.89	
24		6421.5	6329.9	6058.8	5977.08	5777.0	5742.46	
26		7312.2	7118.6	6898.0	6860.74			
28		8233.1	8011.6					
30		9151.9	9080.7					

a) ref. (35) N.P. A472 (1987) 295.
b) ref. (36) N.P. A449 (1986) 537.
c) ref. (37) Phys. Scripta, 24 (1981) 329.

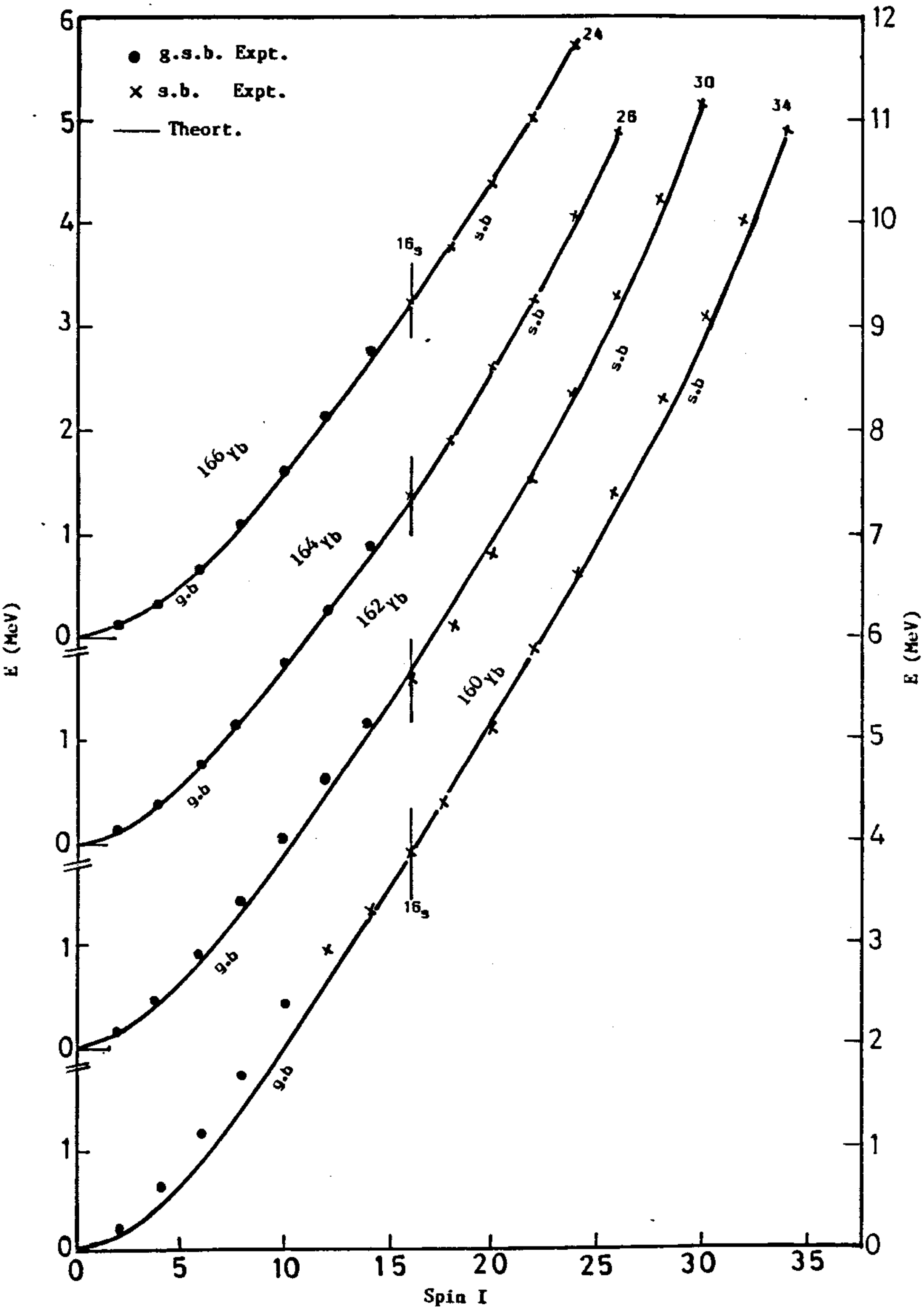

Fig. 1 : Plot of the level excitation energies (yrast sequences) as a function of spin for $^{160,162,164,166}Yb$ connected by a theoretical curve derived by fitting eq. (2.4) (B.P. Method I) to the experimental energies for ($I \leqslant 14^+_g$ and $I \geqslant 16^+_s$).

One can note from Fig. (1) and the tables 1 and 2 that the agreement depends on the number of the s.b. members participated in the fitting. The numbers are 5,6,9 and 12 for ^{166}Yb, ^{164}Yb, ^{162}Yb and ^{160}Yb respectively.

The general trends predicted by the extension of eq. (2,4) considering the states of both bands (g.b. & s.b.) observed below and above the crossing may be qualitatively reasonably up to even high spin $I^{\pi}_{s} \geqslant 34^{+}_{s}$.

III.1.b- **(VMI) Predictions** :

In an attempt to obtain still better agreement with experiment, we have used eqs. (2.5, 2.6). Once $\mathcal{J}_o$ and c were determined for the ground band below I_{cross}, they were substituted back in eq. (2.5). The other two adjustable parameters of the model[29], E_o and A, were determined for the superband and substituted in eq. (2.6). These two equations are solved for E corresponding to each value of I. It should be remember that the parameters $\mathcal{J}_o$, c, E_o and A were determined so as to yield a best fit to the experimental energies. The results obtained are listed in table 1 (column 3 for ^{160}Yb) and table 3. The energy levels predicted are shown in Fig. (2) as compared with the recent experimentally known data for the four Yb isotopes. A good agreement is shown. It can be seen, in Fig. (2), the s-band crosses the g.b. around spin 12^+ for ^{160}Yb & 14^+ for the other three isotopes and may cause backbending. The back-bending phenomenon is currently interpreted as the band crossing of the ground state rotational band (g) and the spin aligned particle s-band (s). Especially $i_{13/2}$ neutrons are considered to be responsible for the backbending in the rare-earth nuclei due to the large coriolis force(46). The three nuclei $^{162,164,166}Yb$ exhibit such a behaviour (first backbending) between $I \approx 13\text{-}16\ \hbar$.

Fig. (2) illustrates the crossing along the yrast band in those Yb nuclei. The crossing is observed twice along the yrast band in ^{160}Yb(34). The 1st crossing occurs around $\hbar\omega_{c_1} \simeq 0.24$ MeV and spin $I \sim 10\text{-}12\ \hbar$, and the second one occurs around critical frequency of $\hbar\omega_{c_2} \approx 0.42$ MeV, corresponding to spin values of $I \simeq 28\ \hbar$. It was found that, the agreement between the fitted and the experimental energy levels for the s'.b. ($28 \leqslant I \leqslant 40$) is very good. The s-band levels are fitted with the parameters (E_o = 1.6012 MeV, A = 0.00827), and their values of (E_o = 2.522 MeV, A = 0.00709) were fitted in to the s'.b. states of spin 28^+ up to 40^+.

To confirm the results obtained for any 2nd crossing, especially in ^{160}Yb, I have compared the calculated