

PROGRESS REPORT ON THE PH III 67/41 EXPERIMENT:SC16MUON PARTIAL CAPTURE RATES IN  $^{11}\text{B}$ .

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The results of muon partial capture-rate measurements we done on  $^{11}\text{B}$  verify the inversion of the shell-model states in  $^{11}\text{Be}$  conjectured by Talmi and Unna <sup>1)</sup>.

In the first step we measured  $\lambda = \lambda_1$  (ground state) +  $\lambda_2$  (first excited state) i.e. the total capture-rate to the two bound states of  $^{11}\text{Be}$  using the activation method <sup>2)</sup>

If the above mentioned level inversion holds, then from selection rules,  $\lambda_2$  is expected to be almost equal to  $\lambda$ . Therefore, in the second step of our experiment, we had to observe the de-excitation gamma-line from the  $^{11}\text{Be}^*$  (320 keV-state).

This gamma-line observed by a GeLi detector of 35cc, is represented on the Fig.1

The Table 1 summarizes the experimental results on muon partial capture-rates we obtained on  $^{11}\text{B}$ . The results are compared to the theoretical possibilities.

From the experimental results, one can certainly conclude that the excited state has negative and the ground state of  $^{11}\text{Be}$  has positive parity.

The Fig.2 represents the time-dependence of the 320 Kev gamma-yield normalized to the  $\mu^- \rightarrow e^-$  yield.

The experimental points are compared to curves with increasing and decreasing spin-sequencies. The conversion rate R, between the h.f. states of the  $^{11}\text{B} + \mu^-$  system is taken from reference 4. This comparaisn excludes 5/2 final spin; the 1/2 assignment which is in excellent agreement with the experiment is not unique because 3/2 final spin could give accidentally a curve similar to the upper one of Fig. 2. <sup>5)</sup>

Furthermore, we have evidence for the E1 character of the 320 Kev gamma-transition from his Doppler-broadening.

In conclusion, all our results support the level-structure of  $^{11}\text{Be}$  proposed by Talmi and Unna.

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CM-P00073441

Références.

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Table 1.

Muon partial capture-rates in the reaction  $^{11}\text{B}(3/2^-) + \mu^- \rightarrow ^{11}\text{Be}$  (ground and first excited state) +  $\nu_\mu$ .

	Experiment	THEORY	
		Shell-model 3)	Talmi - Unna 3)
$\lambda_1 + \lambda_2$	$(1100 \pm 80) \text{ s}^{-1}$	$(3000-4000) \text{ s}^{-1}$	$(3000-4000) \text{ s}^{-1}$
$\lambda_2$	$(1000 \pm 100) \text{ s}^{-1}$		
$\lambda_1/\lambda_2$	$0.1 \pm 0.1$	7	0.14

Fig. 1: Spectre gamma de la réaction  
 ${}^{13}\text{C} + \alpha \rightarrow {}^{16}\text{O} + \gamma$

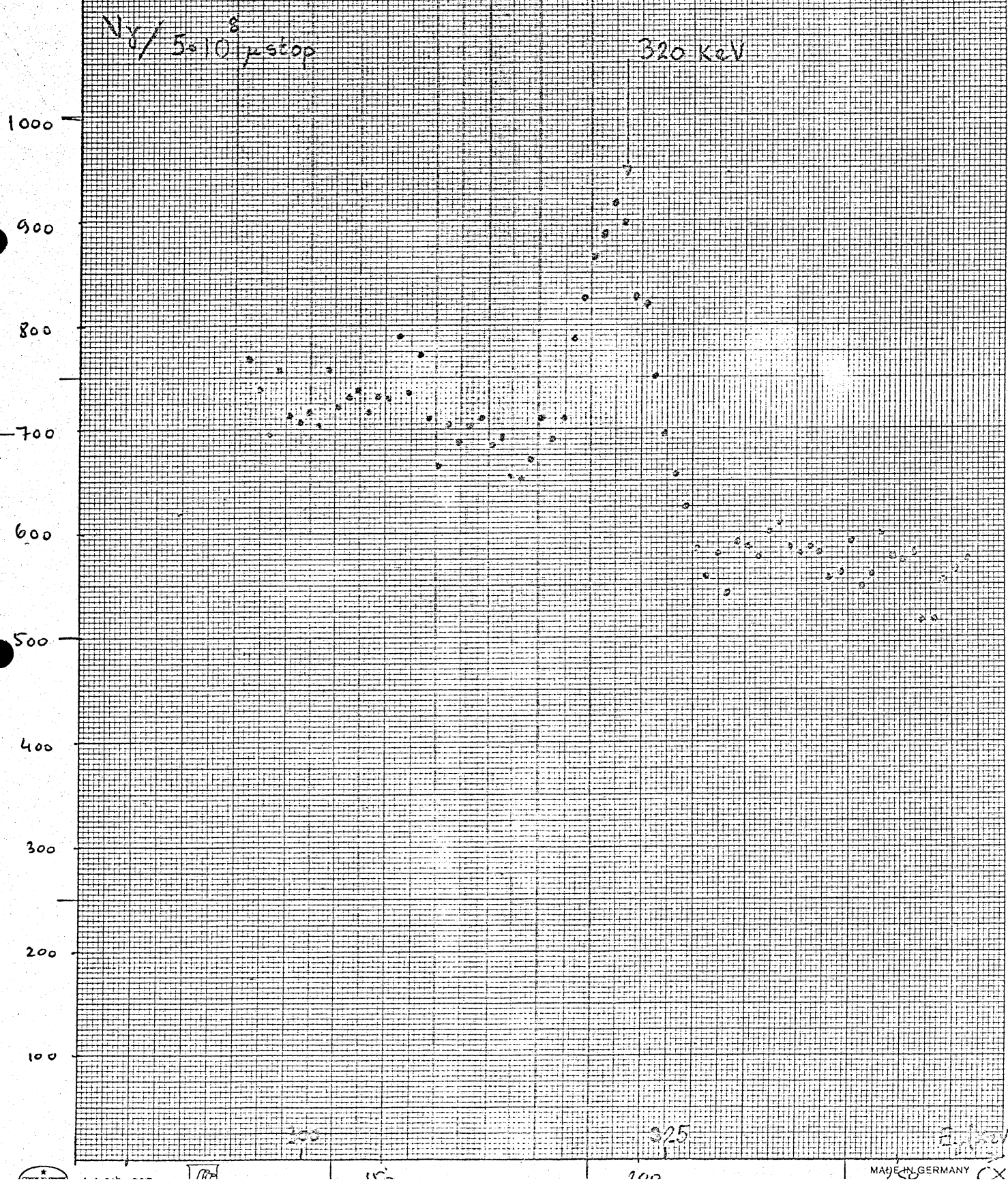


Fig. 2: Dépendance du temps de gamma 320 KeV dans la desexcitation de  $^{11}\text{Be}^*$

