tion for Sailor's method, but a more accurate Doppler correction would reduce Γ below 0.030 ev by a very small amount.[3]

The energy of the peak is quite high for the peak to be a scattering cross section discontinuity caused by a crystal edge in the sample. In addition, such an effect would result in a sawtooth peak rather than a symmetrical one.

A search of existing cross-section data[4] indicates that the 0.43-ev peak is probably not due to a contaminant. If it is assumed that any element having such a narrow resonance (0.030 ev) must have an atomic weight $A>150$,[5] most of the remaining elements can be ruled out by their cross section data. Gd, Tb, and the radioactive elements Ra, Ac, and Pa are the only elements for which measurements for the 0.43-ev region have not been published. The radioactive elements can be ruled out as possible contaminants since the sample shows no alpha activity. Effects of a high resonance at 0.43 ev in Gd would be expected to extend into regions where measurements exist, even though there is a gap in existing data from 0.2 to 1 ev. If the resonance is assumed to be caused by a Tb impurity, and its width and atomic weight are compared with the data from Fig. 1 of the paper of Hughes and Harvey,[5] then the point for this resonance is seen to be farther below the solid curve than any other point plotted there. Thus a Tb impurity is probably not the cause of the 0.43-ev peak. If the resonance is due to Ta^{181}, the value of $g\Gamma_n$ would be expected to be of the order of 10^{-4} ev instead of 0.8×10^{-8} ev.

The above considerations led to the hypothesis that another stable (or long-lived) isotope of tantalum exists. Earlier measurements[6] placed the upper abundance limit of a second isotope at 100 ppm (parts per million). If such an isotope exists and has a resonance at 0.43 ev, it would be expected to have a peak height of the order of 10^4 to 10^5 barns. Considering the observed peak, this would correspond to a relative isotopic abundance of the order of 20 to 200 ppm. The other isotope would probably be within two mass numbers of 181 since there are no known cases of odd-Z elements with $Z>19$ having more than two naturally occurring isotopes. When such elements do have more than one isotope, not more than two mass numbers separate them. Thus the atomic weight of a second Ta isotope should be 181 ± 2. It is quite probable that the second isotope is radioactive since the second naturally occurring isotopes of other odd-Z elements with Z between 64 and 76 are radioactive.

The authors suggested the hypothesis, that a second isotope of Ta exists, as one which could be proved or disproved by use of the recently completed high intensity mass spectrograph at Knolls Atomic Power Laboratory, Schenectady, New York. The KAPL group accepted the suggestion and obtained the results given in an accompanying "Letter to the Editor."[7] If one uses their measured value of 123 ± 3 ppm for the relative abundance of Ta^{180}, the present total cross section data give the following isotopic single-level Breit-Wigner parameters for the 0.43-ev neutron resonance in Ta^{180}: $E_0=0.433\pm0.004$ ev, $\sigma_0=12\,900\pm1000$ barns, $\Gamma=0.030\pm0.005$ ev, and $g\Gamma_n=0.6\times10^{-4}$ ev. These parameters are especially interesting since Lu^{176} is the only other odd-odd isotope with $Z>7$ for which resonance parameters have been determined.[8] The assignment of this isotope to an odd-proton–odd-neutron position strengthens the possibility that it is radioactive since all other known odd-odd nuclei with $Z>7$, except V^{50}, are radioactive.

* Work performed under the auspices of the U. S. Atomic Energy Commission.

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New Naturally Occurring Isotope of Tantalum

F. A. White, T. L. Collins, Jr., and F. M. Rourke

Knolls Atomic Power Laboratory, General Electric Company, Schenectady, New York*

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WE have carefully examined the mass spectrum in the region of Ta^{181} and find that Ta^{180} exists as a naturally occurring isotope of low abundance.[1] New isotopic values for tantalum are as follows:

Isotope	Abundance (%)	
180	0.0123±0.0003	
181	99.988	
177, 178, 179	<0.0003	not observed
182, 183	<0.0002	

The reason for this isotope not being previously observed[2] is probably, in part, that it is obscured by scattered Ta^{181} ions when the beam intensity is reasonably large. In the present measurement, a tantalum ribbon filament was used as a thermal ionization source. A twenty-stage electron multiplier was used to count individual positive ions[3] and the 180/181 ratio was actually determined by evaluating a counting ratio rather than by interpreting a rate meter integral curve, (see Fig. 1). The Ta^{180} peak corresponded to an ion current of about 10^{-18} ampere.

Two different mass spectrometers were used to make isotopic identification of Ta^{180}. The first was a single 6-inch radius-of-curvature analyzer of 60°. The second was a two-stage analyzer having 12-inch radius −90°

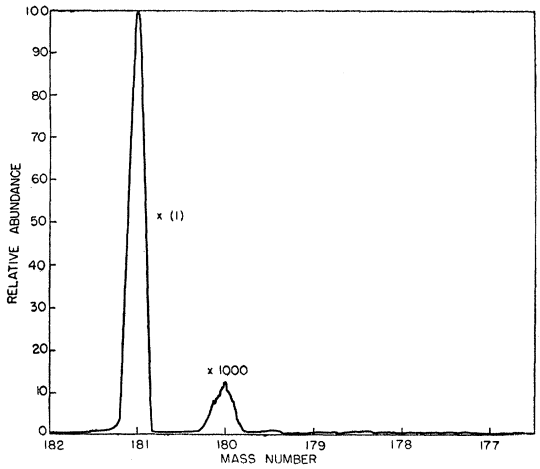

FIG. 1. Tantalum mass spectrum obtained from a two-stage magnetic analyzer utilizing two 90°, 12-inch radius-of-curvature sectors in tandem. The curve is a trace of the output of a twenty-stage electron multiplier detector when integrated by a counting rate meter.

magnetic sectors. It was this latter instrument[4] which was specifically designed for high-abundance sensitivity work, in which the above measurements were made. The 6-inch radius instrument yielded the same values, but the poor resolution did not allow for as much precision in the 180/181 ratio. The absence of isobars of tungsten and hafnium is indicated and oxides of lighter element parents are also excluded (Fig. 1). In addition, the mass difference between 180 and 181 was measured to be 1 mass unit within 1 percent, thus excluding the 180 peak as arising from any simple compounds. Further, the 180/181 positive ion ratio was found to be constant over a wide temperature range for many samples.

* Operated by the General Electric Company for the U. S. Atomic Energy Commission.

[1] The existence of another isotope of tantalum was suggested as a possibility in order to explain a small neutron cross-section resonance at 0.44 ev, not thought to be ascribable to the known nucleus, Ta^{181}, J. E. Evans (private communication).

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Proton-Gamma Resonances in Magnesium

S. E. HUNT AND D. A. HANCOCK

Research Laboratory, Associated Electrical Industries Ltd., Aldermaston, Berkshire, England

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IN a recent letter on the ground state of Al^{26}, Kluyver *et al.*,[1] stated that resonances occurring at 315, 387, and 436 kev had been interpreted as $Mg^{26}(p,\gamma)Al^{27}$ resonances by Hunt and Jones.[2]

We feel that the summary of the paper referred to by Kluyver may have led to this misunderstanding, since in the work reported no attempt was made to check Tangen's initial assignment of these resonances.[3]

Later work in which separated isotope targets[4] were used and positron activity from both $Mg^{24}(p,\gamma)Al^{25}$ and $Mg^{25}(p,\gamma)Al^{26}$ were observed has been reported elsewhere. The γ-ray yield from a separated Mg^{25} target has also been observed and the resonances from magnesium have been identified as follows:

$Mg^{24}(p,\gamma)Al^{25}$: 225.5±0.2 and 418.4±0.5 kev.

$Mg^{25}(p,\gamma)Al^{26}$: 316.7±0.7, 391.5±0.5, 436.5±0.4, 495.6 ±0.6, 513.4±0.7, 530.4±0.7 kev.

$Mg^{26}(p,\gamma)Al^{27}$: 338.5±0.5 and 454.2±0.3 kev.

The positron yield from a natural magnesium target and the γ-ray yield from a separated Mg^{25} target as a function of proton energy are shown in Fig. 1.[5] The higher statistical accuracy obtained from the positron

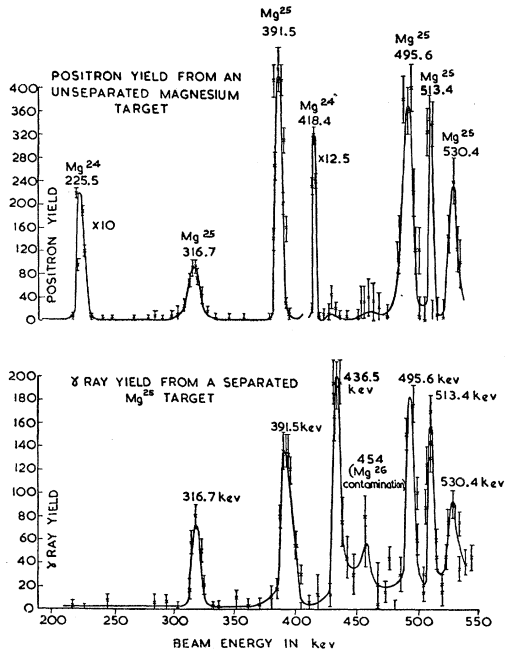

FIG. 1. Positron and γ-ray yield curves for the $Mg^{25}(p,\gamma)Al^{26*}$ reaction.

yield curves has made possible more accurate estimations of these resonances, except in the case of the 436.5-kev resonance for which the positron yield was not high enough to be detected, though the γ-ray yield from this resonance was greater than that from the other $Mg^{25}(p,\gamma)Al^{26}$ resonances.

The resonance to which Kluyver refers as a doublet at 508 kev is seen from both the positron and γ-ray yield curves to consist of three distinct peaks in agreement with the results obtained by Tangen.[3]

Taking Kluyver's value of 6.350 Mev for the Q value of the proton capture process, the present results indi-