Title
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Authors
Sakai, Mitsuo
Yamazaki, Toshimitsu
Hollander, J.M.

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NEW WEAK BETA TRANSITION FROM $^{88}_Y$

Mitsuo Sakai, Toshimitsu Yamazaki, and J. M. Hollander

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Mitsuo Sakai*, Toshimitsu Yamazaki, and J. M. Hollander

Lawrence Radiation Laboratory
University of California
Berkeley, California

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ABSTRACT

By means of a germanium pair spectrometer, a weak 3.24 MeV gamma-ray has been found in the photon spectrum of $^{88}_Y$, indicating the presence of an electron capture branch to the 3.24 MeV level of $^{88}$Sr. The log $f_{1t}$ was found to be $8.2 \pm 0.2$, which is consistent with a $\Delta I = 2$ yes beta transition and with the spin-parity assignment $2^+$ for this level.
The effectiveness of lithium-drifted germanium detectors as a tool for the study of gamma ray spectra has been amply demonstrated. In the search for weak, high-energy gamma rays, the use of a germanium detector in a pair-spectrometer arrangement is often advantageous, as very good signal-to-noise ratios may be obtained, and only "double-escape" peaks are observed\(^1,2\). We report here the measurement of a very weak beta branch of \(^{88}\text{Y}\) to the 3.24 level in \(^{38}\text{Sr}\) by means of detection of the 3.24 MeV gamma transition with a germanium gamma-ray pair spectrometer.

The levels of \(^{88}\text{Sr}\), an important nucleus from the point of view of the shell model (\(N=50, Z=38\)), are known mostly from the study of the beta decay of \(^{88}\text{Rb}\) by Lazar, Eichler, and O'Kelley\(^3\)). Only the first two excited states of \(^{88}\text{Sr}\) (1.84 and 2.74 MeV) had been observed from \(^{88}\text{Y}\) decay\(^4\)). Since the decay energy of \(^{88}\text{Y}\) is known to be 3.62 MeV\(^4\)), it is of interest to determine the extent to which the 3.24 MeV level in \(^{88}\text{Sr}\) is populated by its decay, and to learn more about the properties of this level.

The gamma-ray spectrum from a source of \(^{88}\text{Y}\) was examined with a germanium pair-spectrometer described in ref. 2. In addition to pair peaks from the known 1.836 and 2.735 MeV gamma-rays, a weak pair peak was observed at 2.22±0.02 MeV, which corresponds to a gamma-ray of 3.24±0.02 MeV. The gamma-ray relative intensities, given in table 1, were deduced with use of the pair-peak efficiency curve of ref. 2. A singles spectrum was also recorded; in it a peak was observed at 2.22 MeV but in this case the interpretation is ambiguous since the energy coincides with that of the one-annihilation escape peak from the 2.735 MeV gamma-ray.
Calculation of the log $f_t$ for electron capture of $^{88}$Y to the 3.24 MeV level was made by using the measured gamma-ray intensities together with the branching ratio $I_{\gamma}(3.24)/I_{\gamma}(1.39) = 0.23$ observed by Lazar et al.\textsuperscript{3}) from $^{88}$Rb decay. A decay energy $Q_{BC} = 3.62$ MeV was assumed\textsuperscript{4}). The log $f_0$ was found to be $9.3 \pm 0.2$, which is compatible with interpretation of the transition as being of the $\Delta I=2$, yes type. This becomes log $f_1 = 8.2 \pm 0.2$ with application of the shape correction factor\textsuperscript{5}). Since the spin-parity assignment 4- is considered fairly definite for $^{88}$Y, this information strengthens the assignment 2+ made to the 3.24 MeV level of $^{88}$Sr by Lazar et al.\textsuperscript{3}) on the basis of the gamma-ray branching ratio.

The decay scheme of fig. 1 summarizes the $^{88}$Y data.

One of us (M.S.) wishes to thank Professors I. Perlman and J. O. Rasmussen for their hospitality during his stay at the Lawrence Radiation Laboratory.
References


4) Nuclear Data Sheet, Nuclear Data Group, Oak Ridge National Laboratory, Oak Ridge, Tennessee, NRC 6-2, 3-146 (July 1964)

5) J. F. Davidson Jr., Phys. Rev. 82 (1951) 48
Table 1

<table>
<thead>
<tr>
<th>Energy of pair peak (MeV)</th>
<th>Transition energy (MeV)</th>
<th>Relative intensity of pair peak</th>
<th>Relative efficiency</th>
<th>Relative intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.814*</td>
<td>1.836</td>
<td>47250 ± 230</td>
<td>4.3 x 10^{-3}</td>
<td>100</td>
</tr>
<tr>
<td>1.713*</td>
<td>2.735</td>
<td>630 ± 30</td>
<td>9.2 x 10^{-3}</td>
<td>0.63 ± 0.04</td>
</tr>
<tr>
<td>2.22 ± 0.02</td>
<td>3.24 ± 0.02</td>
<td>14 ± 4</td>
<td>1.35 x 10^{-2}</td>
<td>(9.5 ± 3) x 10^{-3}</td>
</tr>
</tbody>
</table>

*These energies were taken as standards
Fig. 1. Decay scheme of $^{88}$Y.
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