μg/cm² laminated Formvar-polystyrene film. The source material itself was approximately 1 mg/cm² thick.

The beta-ray distribution curve shown in Fig. 1 was obtained on a thin lens beta-ray spectrometer similar to that described by Deutsch *et al.*[5] The counter tube window was 2 mg/cm²-thick and no window corrections have been made. The Kurie plot of the data is shown in Fig. 2. There appear to be two higher energy components which are attributed to a small amount of Eu^{155} activity which was known to be present in the source. Figure 3 shows the Kurie plot of the samarium activity after the higher energy components have been subtracted. The beta-ray end point is 79 kev. Several determinations of the distribution give end-point energies which agree within three kilivolts of this value.

Because of the source thickness and the window cut-off an analysis of the shape of the spectrum would be meaningless and has not been attempted.

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Hyperfine Structure and Nuclear Spin of Kr^{83} and Ne^{21} Investigated with Separated Isotopes

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Highly enriched samples of Kr^{83} and Ne^{21} have been prepared with a mass spectrograph[1] by collecting the ions of the separated isotopes in aluminum plates as previously described.[2] These plates were mounted as electrodes in Geissler tubes (volume ~30 cc) filled with helium at a pressure of 5–10 mm in order to obtain the most favorable conditions for exciting the small amounts of isotopes to be investigated.[3] The isotopes were released from the electrodes by h.f. induction heating. When cooled with liquid air the tubes yielded intense Kr- and Ne-spectra without any impurities.

In earlier investigations of the spectrum of normal krypton, the nuclear spin of the only odd isotope Kr^{83} (11.53 percent) has been determined to be 9/2 with high probability.[4,5] However, due to the predominance of the even isotopes, certain h.f.s. components were masked, and it therefore seemed desirable to check the spin value from the interval rule by means of enriched Kr^{83}.

By using a tube containing about 2 μ moles of Kr^{83} (separated in a four-hour run), interferograms were photographed with a Fabry-Perot etalon showing the structures of the $1s-2p$ combinations in the infra-red. Measurements of the components of 8059A ($1s_3-2p_4$), from which the spin can be most simply deduced because of the spherical symmetry of the only splitting upper term $2p_4$, at first turned out to be in disagreement with the spin value 9/2, which should give rise to a h.f.s. pattern as shown in Fig. 1. This disagreement was later found to be caused by the presence of about one percent Kr^{82}, probably brought into the beam of mass 83 by the formation of $(Kr^{82}H)^+$ ions,[6] which brings about a slight displacement of the component b toward a.

The intervals x and y can, however, be indirectly determined by measuring the total splitting $x+y$, and by using the fact that the center of gravity must be located at a point Z in a distance y from a. This fact follows simply from interval and intensity rules. The center of gravity Z again coincides with the position of the line from the even isotopes, if no isotope shift exists.

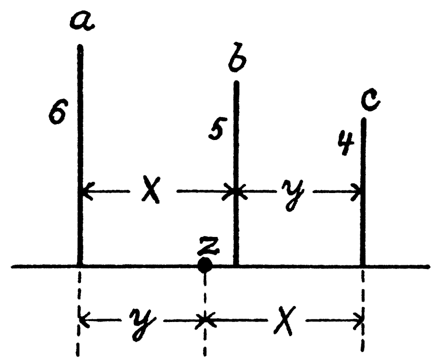

Fig. 1. Hyperfine structure of the Kr^{83} line 8059A.

In order to examine this last point, tubes containing very pure Kr^{82} and Kr^{84}, respectively, were prepared. By comparing interferograms taken alternately on the same plate with these tubes, an isotope shift of 0.002 cm^{-1} was detected for the line in question. This value is of the order of magnitude to be expected from Bohr's theory of the Rydberg constant, and consequently, the center of gravity Z for Kr^{83} must be situated symmetrically between the lines from Kr^{82} and Kr^{84}. By measuring interferograms taken in turn with Kr^{82}, Kr^{83}, and Kr^{84}, and by taking into account the isotope shift, the intervals x and y could be accurately determined. The final values were $x+y=0.192$ cm^{-1}, and $x/y=0.106/0.086$, which definitely give the spin value 9/2 (theor. val.: $x/y=0.1055/0.0865$).

An isotope shift of the same order of magnitude (0.002 to 0.004 cm^{-1}) was further found to exist for all measured $1s-2p$ combinations. In all cases the components of shorter wave-length belong to the heavier isotope. Finally, it should be mentioned that the intervals of the Kr line 7685A ($1s_2-2p_1$), for which only the lower term $1s_2$ splits up, were measured to be 0.138 and 0.108 cm^{-1}, which confirms the existence of a quadrupole moment of the Kr^{83} nucleus.[5]

The procedure here described was also used for investigating the h.f.s. of the rare isotope Ne^{21} (0.27 percent), since earlier experiments using neon, enriched by diffusion, showed no components from this isotope.[7] Interferograms photographed with a tube containing about 0.2 μ mole of Ne^{21}, collected in a ten-hour run, showed narrow h.f.s. structures of all $1s-2p$ combinations. Also in these experiments certain components were masked by a line originating from the lighter isotope (Ne^{20}), which in the final separation was present in nearly the same amount as Ne^{21}. This fact complicates accurate measurements of the structures, of which in most cases only one component could be observed, situated on the short wave-length side of the Ne^{20} line in distances of 0.05–0.07 cm^{-1}. However, by comparing intensities of the components of the lines 5852A ($1s_2-2p_1$), and 6266A ($1s_3-2p_6$), for which the structures are caused by the splitting of the lower and of the higher term, respectively, the magnetic moment was found to be negative and the spin to be 3/2 or possibly greater. The investigations with Ne^{21} will be continued, and further details for Kr^{83} will be published in the *Proceedings of the Royal Danish Academy of Science.*

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