Abstracts of Papers

The following twenty-three papers are the second part out of sixty-three papers read before the semi-annual meeting of the Institute on November 28 and 29, 1952.

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1. On the Backscattering of the Electrons from Co^{60} and Na^{22}

Toshio AZUMA, Kunihiko TSUMORI, and Sakae SHIMIZU.

(K. Kimura Laboratory)

Using the double coil, thin lens magnetic beta-ray spectrometer, we measured the ratio of the backscattering of negative and positive electrons emitted from the sources of Co^{60} and Na^{22} respectively. Also we observed the spectra of monochromatic negative electron which were scattered backwards from four elements.

In the measurement of the ratios of the backscattering, we mounted in the spectro-chamber the rotor of Cu-plate (64 mm. in diameter), on which the five scatterers of different elements (7 mm. in diameter) were put symmetrically. The rotor could be rotated by the handle settled on the outside of the spectro-chamber. By this device we could maintain the equality of the geometrical arrangement when we changed the backscatter. The results obtained are shown in Table 1.

Table 1. The ratio of the backscattering.

Source / $H\delta$ / Scatterer	Na^{22} (β^+)				Co^{60} (β^-)	
	1799	1912	2024	2137	1513	1688
Pb	100	100	100	100	100	100
Sn	83.2	85.2	83.6	82.8	84.8	85.5
Cd	77.0	80.8	81.5	80.5	85.5	84.5
Cu	61.1	63.7	64.6	64.6	59.5	59.8
Al	24.7	25.9	24.6	25.3	34.2	35.7

In the measurements of the spectra of monochromatic negative electrons which were scattered backwards from four elements, we used the photo-conversion line of the Zn^{65} gamma-rays (1.114 Mev). The source, Zn^{65}, was attached just before the backscatterer. The difference of the spectrum, which was observed with and without the thin lead foil put on the source, gave the spectrum of the backscattered electrons. The peak positions and the momentum distributions of the spectra, obtained by the above procedure, showed the same results as those of Bothe (*Zeit. für Naturforschung*, 4, 542 (1949)). The peak positions of the spectra were as follows: for Al, 0.67; Cu, 0.87; Sn, 0.91; Pb, 0.93, where the unit was E/E_0 and E_0 was 4833 $H\rho$.

2. Trial Construction of the Small Betatron. (I)

Pole Face Angle Determination for the Focusing Magnetic Field

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Magnetic field which decreases according to the increase of radius is always necessary in circular accelerators and magnet type beta-ray spectrometer, where the magnetic focusing is of importance. It is difficult to solve this problem analytically, and few results have been reported. But the following simple consideration can give the result which is in fairly good agreement with some experimental results.

We assume first, that the pole faces of the magnet are the magnetic equipotential surfaces and the line of force is of such a shape as indicated in Fig. 1. Next, we assume that the magnetic field decreases with increasing radius in the range of $r=r_1$

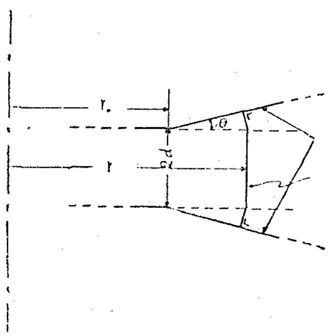

Fig. 1. Assumed shapes of the magnet and magnetic line of force.

to $r=r_2$ in such a manner as is required from the magnetic focusing condition.

Now the magnetic field strength H at radius r from the center is given by

$$H=\frac{V}{l},$$

where V is the magnetic potential difference between poles and l is the length of the line of force which is given by