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On the Short-Circuiting Condenser in Kyoto Cyclotron

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In order to prevent discharge in the accelerating chamber during the operation, the dees of our cyclotron are insulated from ground and the ordinary shorting bars which determine the length of the dee lines have been replaced by the short-circuiting condensers to apply a d.c. bias to the dees. To be usable such condensers should fit for the large current of about 2000 ampere of about 13 MC with the small H-F loss as possible.

Taking this condition into consideration we have designed a condenser which consists of eight small water cooled plate condensers, each of which consists of 33 plates of aluminum of 1 mm thickness separated by 1.5 mm gaps giving 5900 pF. When H-F voltage of 75 KV is applied on the dee, it is expected that 135 amperes at 340 volts (peak) flow through one small condenser. Under such condition some properties of the condenser have been observed in connection with the following relations :

- 1) The relation between the vacuum and the supplied H-F voltage at a constant bias voltage.
- 2) Observation of discharges with various bias voltage and a constant vacuum.
- 3) The relation between the H-F voltage and the electrical power loss.
- 4) Measurements of the electrical power at the equilibrium temperature.

From the observations it has been ascertained that under our operation conditions, the discharge is suppressed by applying a bias voltage of more than 300 volts at the vacuum of 1×10^{-4} mmHg and the water-cooling is satisfactory and the power loss is about 2 KW in our design.

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Beta-Spectra of Ag^{110} and Sb^{124}

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Beta-spectra of Ag^{110} and Sb^{124} are measured using the double coil, magnetic lens beta-ray spectrometer of about 2 percent resolving power. The detector consists of a G-M counter with Zapon window which will detect electrons of 5-kev and above, and mica window of 2.9

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mg/cm² which is used for the high energy beta-ray above 200-kev. The sources used had a surface density of 50~100 μg/cm² thickness.

The measured beta-groups are investigated by the Fermi analysis. The correction factors of the first and second forbidden and also of the mixed interactions are studied for the highest energy beta-groups from these elements.

For the decay of Ag¹¹⁰, three soft beta-groups of allowed shape with end points of 80, 314, and 530 kev are found, whose ratio of intensity is 10.7 : 3.2 : 15.3. For Sb¹²⁴, five beta-groups with end points of 2.39, 1.68, 1.07, 0.63, and 0.28 Mev are found, in which the beta-groups of the highest energy is the first forbidden mixed interaction for (ST) or (VA) forms and the other groups are allowed shape. Their intensity is 22, 6, 4, 56, and 12 percent, respectively.

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Efficiency of Geiger-Muller Counter

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It will be necessary to investigate the efficiency of the Geiger-Müller counter which is used in the double coil, magnetic lens beta-ray spectrometer, because the efficiency depends on the energy of beta-rays especially when measured at the low counter pressure. The G-M counter used in the present work is the side window type whose dimension is 19 mm in inner diameter and 41 mm in length. Zapon film of about 20 μg/cm² is used as a counter window. The source used is Cs¹³⁷ which is put on thin Zapon film of about 30 μg/cm² and dried quickly under an infra-red lamp. The 518-kev beta-spectrum of Cs¹³⁷ has been investigated by many workers and found to be the first forbidden tensor interaction. The Fermi plot corrected with the correction factor (p^2+K^2) was on a straight line, where p and K are momentum of electron and neutrino emitted from the Cs¹³⁷ nucleus.

In the present experiments, the beta-spectrum of Cs¹³⁷ has been measured as a function of counter gas pressure to investigate the differences of efficiency for each beta-energies. The low energy side of this beta-spectrum has been ascertained by a straight line of the corrected Fermi plot. The energy range of the constant efficiency has been measured as 0~140, 200, and 240 kev for the gas pressure of 21, 25, and 40 mm Hg, respectively. These beta-spectrum, measured by means of the mica window G-M counter of 2.9 mg/cm², has been found to deviate from a straight line of the corrected Fermi plot at the energy below 180 kev.

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