4. A Coil Current Stabilizer

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We have constructed the current stabilizer for a thin lens coil beta-ray spectrometer, which needs the maximum exciting current of 10 A. The design of the circuits is the same as those described by Lawson and Tylor (*Rev. Sci. Inst.*, **10**, 304 (1939)), except that 6SN7 and photocell 17GT-1 were used in place of 6C5 and photocell 920, and that 5 Henry choke coil and 500 μ. *f.* chemical condenser were used to eliminate lipple voltage in the motor generator set. No lipple voltage was detected by the osciloscope. The stabilization ratio of this circuit could be increased by the increase of the gain of the direct coupled amplifier, which was attained only by the change of the load registance of the oscillator tube. The direct coupled amplifier could be constructed in a compact case ($220\times365\times200$ mm.) by the use of 6SN7.

The performance of the stabilizer has been very satisfactory. The coil current of the spectrometer has been stabilized at the rate of one part in 50,000 over a period of an hour, and it was so easy to handle that the coil current could be shifted to a new stabilized value within 10 seconds.

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5. The Probable Energy Loss of Electrons in Matter

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Using a double-coil thin lens magnetic beta-ray spectrmeter, the probable energy loss of electrons in passing through thin Mica, Al, Cu, Zn, Ag, Cd, and Sn has been measured. For the monochromatic electrons, the photo-conversion lines produced in a lead radiator by the 0.3499 Mev and 0.6067 Mev gamma-rays of Ra, 1.114 Mev gamma-ray of Zn^{65}, and 1.3315 Mev gamma-ray of Co^{60}, are used.

If we set an absorber foil just before a lead radiator, the peak displacement of the photo-conversion lines shows the probable energy loss in passing through the absorber. Attention was given to the effect of the Compton electrons radiated from the absorber. The peak shifts are shown in Table 1. (B-W-M), (B-B), and (L) in the table mean the calculated values of the stopping power $I\left(=\frac{\triangle(H\rho)}{\mu}\right)$, using the formula of Bohr-White-Millington, Bethe-Bloch, and Landau (*J. Phys. U. S. S. R.* 8, 201 (1944)) respectively.

The results indicated that the probable energy loss of electrons of medium low energy as β_1 and β_2, shows agreement with the Bohr formula within the experimental errors, and for the medium high energy as β_3 and β_4 it shows agreement with Landau formula, and if we correct the value of constant C in Bohr formula as 39.95, the agreements of evaluated and calculated values have been attained.

Table 1.

β / I / absorber	μ cgr/cm²	β_2 (0.8684)					β_3 (0.9432)					β_3(0.9567)				
		Peak Shift △(Hρ)	I				Peak Shift △(Hρ)	I				Peak Shift △(Hρ)	I			
			Measured	(B-W-M)	(B-B)	(L)		Measured	(B-W-M)	(B-B)	(L)		Measured	(B-W-M)	(B-B)	(L)
Al	1.385	78.8	57.0	52.6	66.1	61.8	67.5	49.1	43.6	54.6	50.3	67.5	49.1	42.5	57.2	48.9
Ni	1.546	78.8	52.0	52.5	59.9	61.6	73.1	47.7	43.5	49.7	50.2	73.1	47.7	42.4	52.5	48.7
Cu	1.831	95.6	52.2	50.9	57.1	59.7	90.0	49.1	42.1	47.5	48.5	84.4	46.1	41.1	50 2	47.2
Zn	1.297	–	–	49.7	57.2	58.5	61.9	47.6	41.3	47.5	47.7	61.9	47.6	40.2	50.2	46.3
Ag	1.490	73.1	48.8	47.5	51.2	55.9	61.9	42.2	39.4	42.7	45.5	67.5	45.2	38.4	45.4	44.2
Cd	1.146	50.6	44.0	41.9	46.0	49.5	45.0	39.0	34.8	38.4	40.3	45.0	39.0	33.9	40.8	39.2
Sn	1.163	–	–	45.0	49.2	53.1	50.6	43.6	37.4	41.0	43.3	50.6	43.6	36.5	43.6	42.1
		β_1(0.7508)					β_2(0.8684)					β_4(0.9567)				
Mica	0.403	28.1	70.3	72.9	99.0	89.4	16.9	42.2	49.6	67.6	59.1	–	–	40.3	58.6	46.9
Mica	0.701	50.6	72.3	76.2	〃	92.7	39.4	56.2	51.7	〃	61.3	33.8	48.2	41.9	〃	48.5
Mica	1.057	90.0	84.9	78.6	〃	95.2	61.9	58.3	53.3	〃	62.8	50.6	48.2	43.1	〃	49.7
Mica	1.403	118.1	84.2	80.3	〃	96.9	84.4	60.1	54.4	〃	63.9	67.5	48.2	43.9	〃	50.5