Summary. — Total atomic photoelectric cross-sections of gamma-rays of energy from 88 keV to 1.33 MeV for 34 elements in the range of Z from 12 to 92 have been determined from the accurately measured total cross-sections. Direct measurements on lead for $^{137}$Cs and $^{60}$Co gamma-rays have also been made in a cylindrically symmetric transmission arrangement to obtain total photoelectric cross-sections. The experimental total cross-sections and K-shell cross-sections derived from the measured total cross-sections have been compared with those from the recent theories and measurements. The dependence of total photo-absorption on the atomic number of the absorber and the gamma-ray energy has been studied.

A significant number of investigations has been reported on the interactions in matter of photons in the energy range between 0.1 keV and 1 MeV. References to the theoretical and the experimental papers are found in the compilations $^{(1)}$ $^{(2)}$ published recently. Theoretical investigation on each of the different types of interactions has continued and improved calculations have been

$^{(*)}$ To speed up publication, the authors of this paper have agreed to not receive the proofs for correction.


published for both scattering (3-5) and absorption (6-12) of photons. In view of these theoretical developments and some discrepancies between the experimental and theoretical results in some of the previous measurements, new activities have been resumed on the experimental investigations of gamma-ray interactions. This report presents accurate measurements of total atomic photoelectric cross-sections of gamma-rays in the energy range where relatively few measurements have been reported so far.

The experimental arrangement and our initial measurements of total attenuation of photons have been described previously (13,14). The experimental photoelectric cross-sections have been obtained by subtracting scattering cross-sections which are based on the calculations of form factors and incoherent-scattering functions of Cromer et al. (3-5). The coherent-scattering cross-sections have been computed by interpolation of the tabulated data of Storm and Israel (1). The incoherent-scattering cross-sections have been obtained in the same manner from the tabulated data of Veigele et al. (2). Above gamma energy of 1.02 MeV, correction for pair production was made using the calculated data of Overbo (15,14).

The determination of photoelectric cross-sections of gamma-rays in lead has been made in the present work using the direct method of measuring transmis-

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Fig. 1. – Experimental arrangement of the gamma-ray source, cylindrical absorber totally enclosing the source, and the detector for direct measurement of total photoelectric cross-section. S: gamma-ray source, A: cylindrical absorber, D: detector (X=NaI/T1 crystal, P: photomultiplier, F: aluminium filter).

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