## Chapter 5 Appendix 2

# RADIOACTIVE $^{32}$P PRODUCED IN SULFUR IN HIROSHIMA

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It was expected that when the A-bomb was exploded over Hiroshima fast neutrons would be emitted from the bomb. In the survey made in Hiroshima during the first part of September 1945, the presence of $^{32}$P radiation in sulfur due to the reaction $^{32}$S(n,p) $^{32}$P was confirmed.

Therefore sulfur used as adhesive material in binding the porcelain insulators to the metallic holder on power poles was collected at various parts of the city. The sulfur thus obtained was powdered and 1 g was spread over a 10 cm$^2$ glass plate. The radioactive intensity was measured with a Lauritsen electroscope through a 0.015 mm aluminum window. These measurements were made in Tokyo on 20 September 1945.

Table 1. Measurement of Ionization Current in an Electroscope Due to $^{32}$P Activity in Sulfur Collected

| Location | R Ground Range (m) | I Intensity of beta particle | Location | R Ground Range (m) | I Intensity of beta particle |
|---|---|---|---|---|---|
| A | 270 | 2200 | F | 460 | 1100 |
| B | 120 | 2900 | G | 440 | 1300 |
| C | 350 | 900 | H | 740 | 660 |
| D | 380 | 1100 | J | 1000 | 210 |
| E | 100 | 2200 | K | 860 | 340 |

The results of the measurement of radiation to approximately 1000 m from the hypocenter are shown in Table 1. The first column indicates the places where the material was collected, the second column the distance (R) from the hypocenter (ground range), and the last column the intensity of beta rays (I) per 1 g of sulfur extrapolated to 6 August 1945.

As in the case of bones,[1] the relationship of $r^2 I$ to r is illustrated in Figure 1, where r

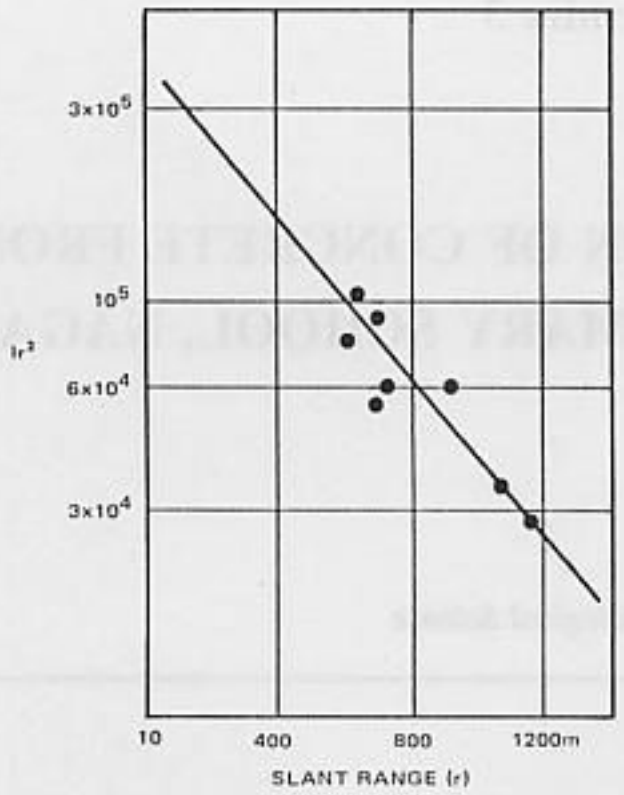


*Figure 1. Ionization current in an electroscope, due to $^{32}P$ activity in sulfur collected at Hiroshima by slant range*

is the distance from the epicenter to the place where the material was found (slant range). From these values, the half-value thickness of the atmosphere against the neutrons was found to be 380 m.

## Reference

1. Yamasaki F., Sugimoto A., Kimura K., 1953. Radioactive $^{32}P$ found in the Human bone in Hiroshima. In the Science Council of Japan, 1953, Collection of Investigation Reports on the Investigation of Atomic Bomb Casualties. Edited by the Committee for Publication of Investigation Reports on the Atomic Bomb Disaster. Japan Science Promotion Society, Tokyo. pp 16-18.