

(7.2) What is the minimum energy that an alpha particle must have to be detected by a GM tube having a mica (the density is approximately equal to aluminum) window of  $1.5 \text{ mg cm}^{-2}$ .

$$A_z := 27$$

First a trial and error method: Test energies between 2.025 and 2.031 MeV and look for a sign reversal.

$$E := 2.025, 2.026 \dots 2.031 \quad \text{MeV}$$

$$R_z(E) := 0.173 \cdot E^{\frac{3}{2}} \cdot A_z^{\frac{1}{3}} - 1.5 \quad \text{mg/cm}^2$$

$E$	$R_z(E)$
2.025	- 0.004
2.026	- 0.003
2.027	- 0.002
2.028	- 0.001
2.029	- 2.869 $\cdot 10^{-6}$
2.03	0.001
2.031	0.002

Thus the lowest alpha energy by "trial and error" is 2.029 MeV

Then we demonstrate a numerical root-locating procedure:

$$E := 2 \quad \text{A first guess}$$

$$\text{root}(R_z(E), E) = 2.029 \quad \text{This is the numerical answer.}$$