

### Physics Cup 2018 - Problem 1. December 31, 2017

Consider infinite lattice of resistors as shown in the figure. Each blue piece of wire between neighbouring nodes has resistance  $R_b = 1\ \Omega$ , and each red piece of wire between neighbouring nodes has resistance  $R_r = 2018\ \Omega$ . (Nodes are marked as black circles.) Let the resistance between the nodes  $A$  and  $B$  (marked in cyan) be  $\rho$ . Find such  $r$  and  $R$  that

$$r \leq \rho \leq R \quad \text{and} \quad R/r \leq 2.$$

(You need to prove that for the values of  $r$  and  $R$  suggested by you, these inequalities hold.)

