Labyrinth Formula

The labyrinth formula of Goebel assume a diffuse source of neutrons at the entrance of a labyrinth. Referring to Fig. 1, which shows a 3-leg labyrinth, assume for the moment such a source at the entrance of the first leg. The length of this leg is L1, the distance from the entrance to the middle of leg 2. The "first leg formula" is:

$$A = \frac{1}{1 + 2.5\sqrt{d} + 0.17d^{1.7} + 0.79d^{3}}$$

In this expression A is the attenuation of the leg and d is the "universal length" of the leg which is equal to the physical Length (L1) divided by the square root of cross sectional area.

The lengths of the other 2 legs are indicated in Fig. 1 by L2 and L3. Note that the beginning of the leg 2 (3) is not measured from the midpoint of leg 1 (2), but starts when one is 'wholly' within the leg. The "second (and subsequent)" leg formula of Goebel is

$$A = \frac{1}{1 + 2.8d(1.57)^{d+2}}$$

Also shown in Fig. 1 are two possible positions of primary beam targets. Suppose one used mcnpx to estimate the dose position at the center of the labyrinth entrance given a beam on the upstream target. It is not 'too bad' in such a case to assume that this dose would be isotropic and that the formula of Goebel as stated above would apply. In the case of the downstream target, however, which is directly in front of the labyrinth entrance, the dose 'down' the first leg is certainly not 'diffuse.' The best approximation here would simply a $1/R^2$ approximation to the center of the end of leg 1, [In the figure, $R^2/(R+L1)^2$] followed by two applications of the leg 2 formula.

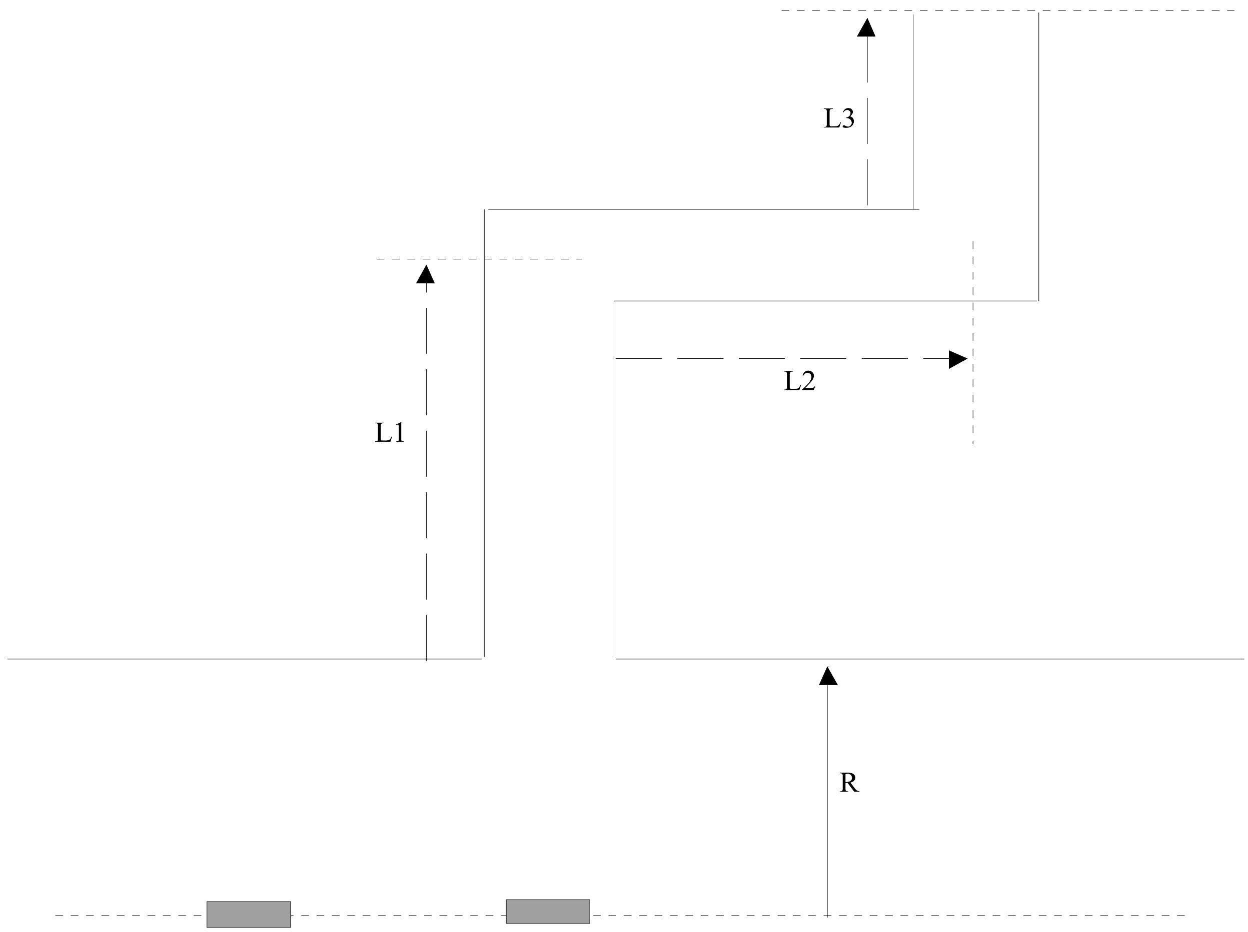

Fig. 1. Plan View of Rectangular Labyrinth