**Exercise B1**

**Problem 1**

A 900 MHz radio link is represented as a knife-edge profile in Figure 1. Tx height is 10 m. Rx's is 0 m.

The additional attenuation due to multiple-edge diffraction must be computed with both the Epstein-Peterson and the Deygout methods.

The following Lee's formulas must be used for single knife-edge loss:

$$L(\nu)=\begin{cases}-20\log\left(0.5-0.62\nu\right) & -0.8<\nu<0\\ -20\log\left[0.5\exp\left(-0.95\nu\right)\right] & 0<\nu<1\\ -20\log\left[0.4-\left\{0.1184-\left(0.38-0.1\nu\right)^2\right\}^{1/2}\right] & 1<\nu<2.4\\ -20\log\left[\dfrac{0.225}{\nu}\right] & \nu>2.4\end{cases}$$

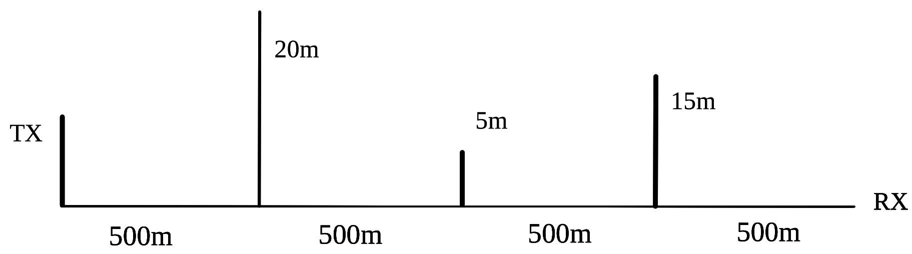


Figure 1

**Problem 2**

Use the method of the "tight rope" to simplify the profile of Figure 1 and then compute the additional attenuation with the two methods as before. Does the result compared to the previous one require any comments?

**Problem 1 solution**

**A) EP method**

We have:

$$h_1=12.5;\ a=b=500m;\ \nu_1=h_1\sqrt{\frac{2}{0.33}\frac{1000}{500\cdot500}}=1.94\rightarrow A_{s1}=19.1dB$$

$$h_2=-12.5;\ a=b=500m;\ \nu_2=-1.94\rightarrow A_{s2}=negligible$$

$$h_3=12.5;\ a=b=500m;\ \nu_3=1.94\rightarrow A_{s3}=19.1dB$$

Thus:

$$A_{sTOT}=38.2\,dB$$

**A) Deygout method**

We have:

$$h_1 = 12.5;\ a = 1500, b = 500m;\ \nu_1 = 1.58 \rightarrow A_{s1} = 17\,dB$$
$$h_2 = 8.33;\ a = 500, b = 1000m;\ \nu_2 = 1.12 \rightarrow A_{s2} = 15.3\,dB$$
$$h_3 = -12.5;\ a = b = 500m;\ same\,as\,before \rightarrow A_{s3} = negligible$$

Thus:

$$A_{sTOT} = 32.3\,dB$$

**Problem 2 solution**

Applying the tight rope the second obstacle is dropped. It is easy to see that nothing changes with the Deygout method.

On the contrary, with the EP method we have:

$$h_1 = 8.33;\ a = 500, b = 1000m;\ \nu_1 = 1.12 \rightarrow A_{s2} = 15.3\,dB$$
$$h_2 = 8.33;\ a = 1000, b = 500m;\ s.a.a. \rightarrow A_{s2} = 15.3\,dB$$

Thus:

$$A_{sTOT} = 30.6\,dB$$

It must be therefore noticed that the EP method is very sensitive w.r.t. tight-rope profile simplifications, while the Deygout one is not so. As a matter of fact the application of the EP method to “ondulating” profiles can lead to a diffraction-loss overestimation, while the result with tight-rope simplification is in good agreement with Deygout’s.

It is therefore advisabile to pre-simplify the link profile using the tight-rope method before applying the EP method, especially for ondulating profiles.