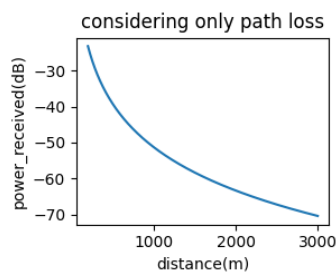


1.第一題主要使用到two-ray ground的模型, gain的公式 $g(d) = \frac{(h_t h_r)^2}{d^4}$
而接收端的功率則是傳送的功率乘上接收端和傳送端的增益, 再乘上channel的增益(不考慮shadowing和fading) $P_R = g(d)P_T G_T G_R$
而如果是用dB的單位, 則是將各元素加起來。

程式跑出來的結果如下

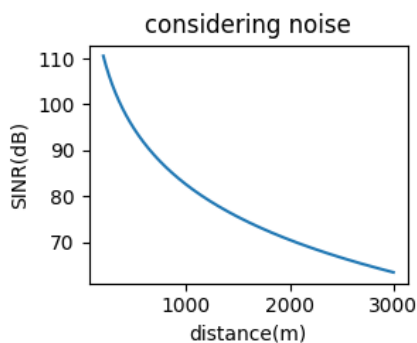


看出收到的power因為和距離的四次方呈反比而隨著距離快速下降。我上網找了實際行動基地台會cover的距離來決定我x軸的範圍

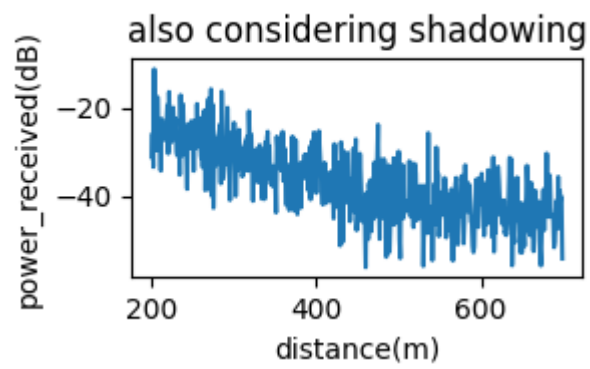
What is the Range of a Cell Tower?

On average, the **maximum** usable range of a cell tower is **25 miles (40 kilometers)** and in some cases, cell tower radio signals can reach up to 45 miles (72 kilometers) in distance. However, due to a number of factors, the **typical** coverage radius of a cell tower is only **1 to 3 miles (1.6 to 5 kilometers)** and in dense urban environments, a cell tower usually reaches **0.25 miles to 1 mile (0.4 to 1.6 kilometers)** before handing off a user's connection to another nearby cell site.

2.第二題要用到thermal noise 的公式 $N = kT_N B$
程式跑出來的結果如下



3.接者要納入shadowing的因素, shadowing是一個取對數後會是常態分佈的函數。我把x軸範圍設在500, 比較好看波動。(原本會是更粗一條)



4.最後就是再考慮熱雜訊。

