Ασύρματες Επικοινωνίες

<u>1ο Σετ Εργασιών</u>

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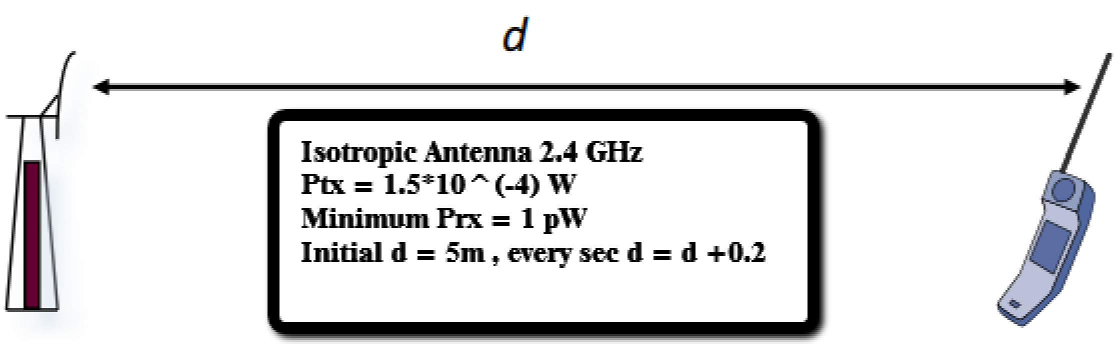
Scenario



1.

<u>Free Space Loss Model</u>:

Prx = Ptx$*\ (\frac{\lambda}{4\pi d})^2 * $ Grx $*$ Gtx (1)

- We can find λ by : λ = $\frac{c}{f} = \frac{3*10^8}{2.4*10^9} = 0.125\ m$
- Also Grx Gtx (gain) is unit everywhere

Back to (1) : $10^{-12} = 1.5 * 10^{-4} * \frac{0.125^2}{(4*3.14*d)^2} * 1 * 1 \ \rightarrow$

$d^2 = \frac{0.125^2*1.5*10^{-4}}{10^{-12}*4^2*3.14^2}$ = 14857.03 → $d_{critical}$ = 121.88 m

2.

- There can be a communication between Tx and Rx in range: (5 , 121.88) meters.
- So the minimum distance the Rx can move and still communicate with Tx is 116.88 meters
- Also in each second Rx can move 0.2m , thus the time he does to reach 116.88 meters is $t = \frac{116.88}{0.2} = 584.4$ seconds
- So after 584.4 seconds the communication between Tx and Rx will be lost

3.

Editor - C:\Users\Teo\Documents\WC\lfree.m

lfree.m

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%Constands
Ptx = 1.5 * 10^(-4)
length = (3*10^8)/(2.4*10^9) %c/f
Prxmin = 10^(-12)

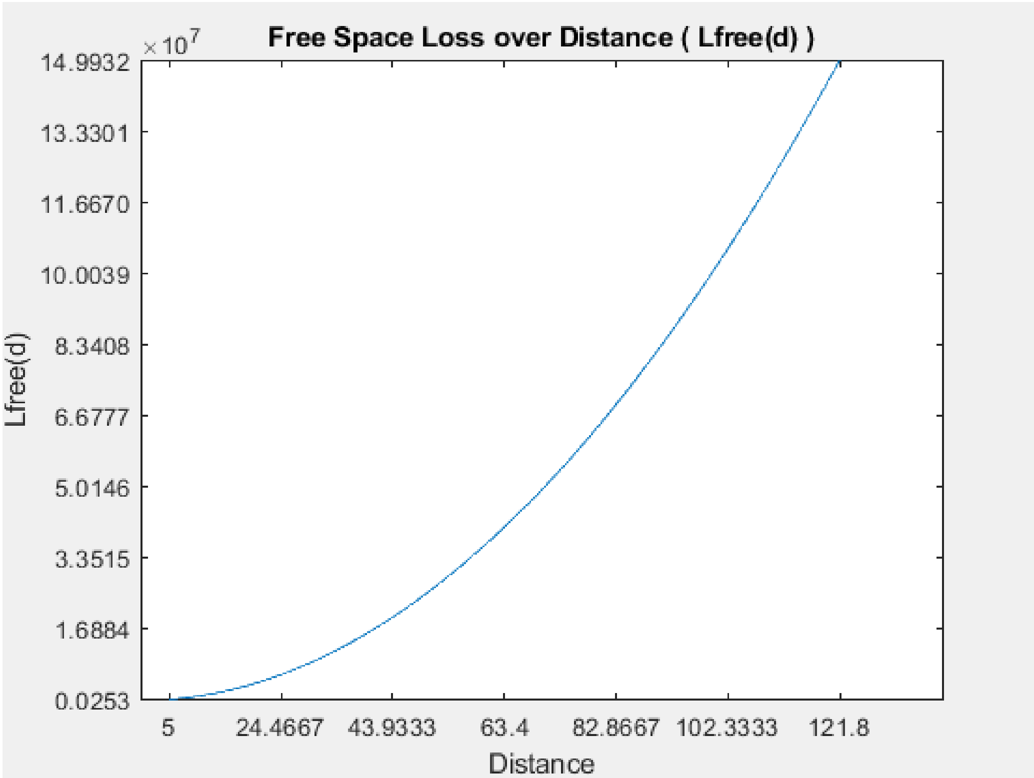
%Evaluate the dcritical
dcritical = sqrt(((length^2) * Ptx)/(Prxmin*(4^2)*(pi^2)))

%Create our distance vector
d= 5:0.2:dcritical

%Evaluate the Prx over distance vector
Prx = Ptx .*((length)./(4.*pi.*d)).^2

%Evaluate the free-space loss
Ldfree = Ptx ./ Prx

%Plot the Free Space loss over distance
plot(d,Ldfree)
title('Free Space Loss over Distance ( Lfree(d) )')
xlabel('Distance')
ylabel('Lfree(d)')
set(gca,'xtick',linspace(min(d),max(d),7),'ytick',linspace(min(Ldfree),max(Ldfree),10))
```


Free Space Loss over Distance (Lfree(d))
×10^7
14.9932
13.3301
11.6670
10.0039
8.3408
6.6777
5.0146
3.3515
1.6884
0.0253
Lfree(d)
5
24.4667
43.9333
63.4
82.8667
102.3333
121.8
Distance