WMC LAB EXPERIMENT 8

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AIM: To simulate the Hata Okumura Model.

THEORY: The Okumura model is a radio propagation model that was built using the data collected in the city of Tokyo, Japan. The model is ideal for using in cities with many urban structures but not many tall blocking structures. The model served as a base for the Hata model. Okumura model was built into three modes. The ones for urban, suburban and open areas. The model for urban areas was built first and used as the base for others.

```
% Matlab code to simulate Hata-Okumura Models
clc;
clear all;
% Input Section
Hbts= 50 ; % Height measured from the base of the BTS tower to the radiationcenterline
Tbts = 350 ; % Terrain elevation at the location of the BTS
Htav= 300; % Height of the average terrain (from 3 Km to 15 km distance from the BTS)
Hm=3 ; % Height of the mobile antenna in meters
f=870 ;% 100:100:3000; %Range of frequencies in MHz
d=3:3:15; % Range of Tx-Rx separation distances in Kilometers
Pt = 19.5; % Power transmitted by the BTS antenna in Watts
Gt= 10; % BTS antenna gain in dBi
%
Hb=Hbts+Tbts-Htav ;% Effective Height of the BTS antenna in meters
%Cell array to store various model names
models = {'Big City (Urban model)';'Small & Medium City (Urban model)';
'Sub-urban environment';'Open Rural environment'};

display('Hata-Okumura Model');
```

```
Hata-Okumura Model
```

```
display(['1 ' models{1,1}]);
```

```
1 Big City (Urban model)
```

```
display(['2 ' models{2,1}]);
```

```
2 Small & Medium City (Urban model)
```

```
display(['3 ' models{3,1}]);
```

```
3 Sub-urban environment
```

```
display(['4 ' models{4,1}]);
```

```
4 Open Rural environment
```

```
reply = input('Select Your choice of environment : ','s');
```

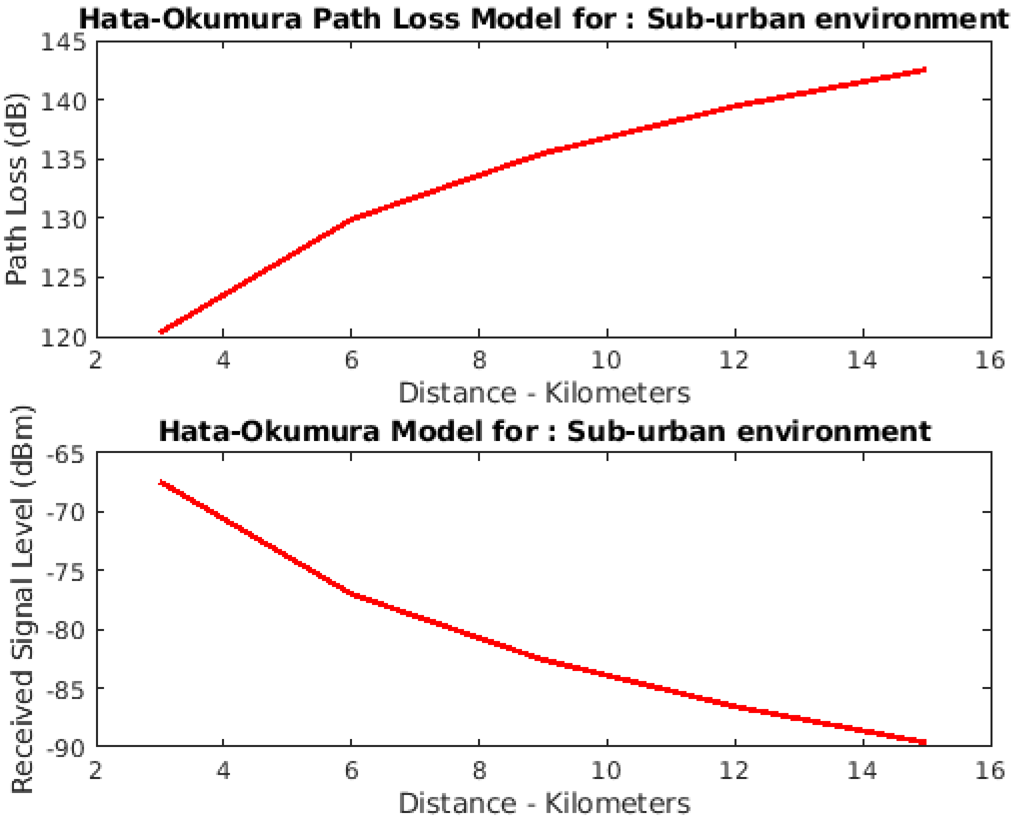
```
if 0<str2num(reply)<4
modelName = models{str2num(reply),1};
display(['Chosen Model : ' modelName])
else
error('Invalid Selection');
end
```

```
Chosen Model : Sub-urban environment
```

```
switch reply
case '1',
C=0;
if f<=200
aHm=8.29*(log10(1.54*Hm))^2-1.1;
else
aHm=3.2*(log10(11.75*Hm))^2-4.97;
end
case '2',
C=0;
aHm = (1.1*log10(f)-0.7)*Hm-(1.56*log10(f)-0.8);
case '3',
aHm = (1.1*log10(f)-0.7)*Hm-(1.56*log10(f)-0.8);
C=-2*(log10(f/28))^2-5.4;
case '4',
aHm = (1.1*log10(f)-0.7)*Hm-(1.56*log10(f)-0.8);
C=-4.78*(log10(f))^2+18.33*log10(f)-40.98;
otherwise ,
error('Invalid model selection');
end
A = 69.55 + 26.16*log10(f) - 13.82*log10(Hb)-aHm;
B = 44.9 - 6.55*log10(Hb);
PL=A+B*log10(d)+C;
subplot(2,1,1)
plot(d,PL,'r','LineWidth',2);
title(['Hata-Okumura Path Loss Model for : ' modelName]);
xlabel('Distance - Kilometers');
ylabel('Path Loss (dB)');
%Compute Received Signal Level
Pr = 10*log10(Pt*1000)+Gt-PL
```

```
Pr = 1×5
  -67.4109  -76.9836  -82.5833  -86.5564  -89.6381
```

```
subplot(2,1,2)
plot(d,Pr,'r','LineWidth',2);
title(['Hata-Okumura Model for : ' modelName]);
xlabel('Distance - Kilometers');
ylabel('Received Signal Level (dBm)');
```



CONCLUSION: From this experiment we have learnt about the HATA-OKUMURA Model.