Modelling Obstacles between UEs and eNB in NetSim LTE

Software Recommended: NetSim Standard v12.1 (32-bit/64-bit), Visual Studio 2017/2019

Follow the instructions specified in the following link to clone/download the project folder from GitHub using Visual Studio:
https://tetcos.freshdesk.com/support/solutions/articles/14000099351-how-to-clone-netsim-file-exchange-project-repositories-from-github-

Other tools such as GitHub Desktop, SVN Client, Sourcetree, Git from the command line, or any client you like to clone the Git repository.

Note: It is recommended not to download the project as an archive (compressed zip) to avoid incompatibility while importing workspaces into NetSim.

Secure URL for the GitHub repository:

https://github.com/NetSim-TETCOS/MODELLING_OBSTACLES_IN_LTE_v12.1.git

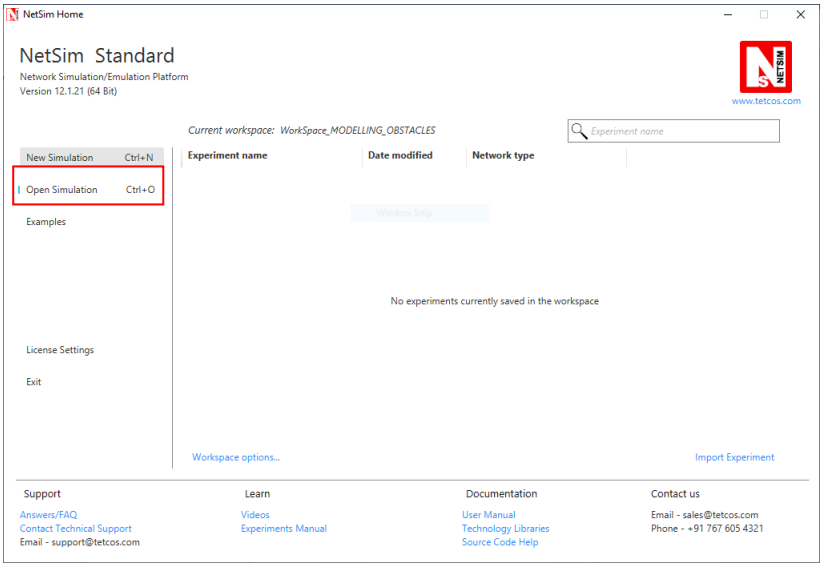
Users can model obstacles and varied channel conditions between the eNB and the connected UEs, by modifying the underlying LTE code.

This is required because, as of **NetSim v12.1**, in the GUI, the wireless link (between one eNB and the connected UEs) properties are same i.e. if we change in one link it reflects in all the other links of UEs connected to same eNB.

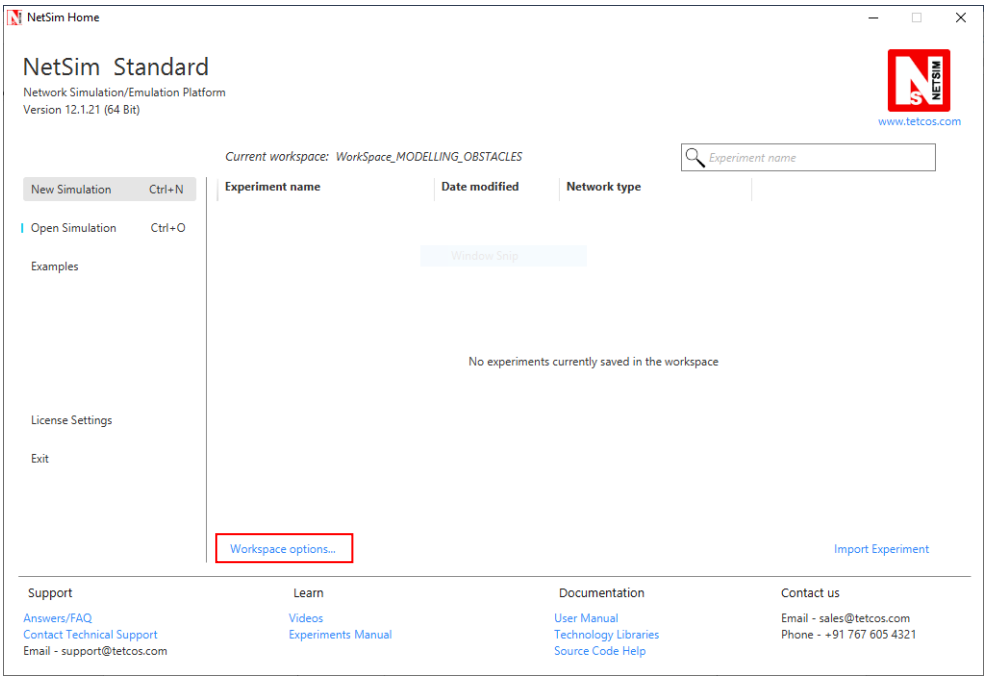
Obstacles are modelled by adding an attenuation (in dB) value. Varying channel conditions are modelled by changing the pathloss exponent between the eNB and connected UEs.

Steps:

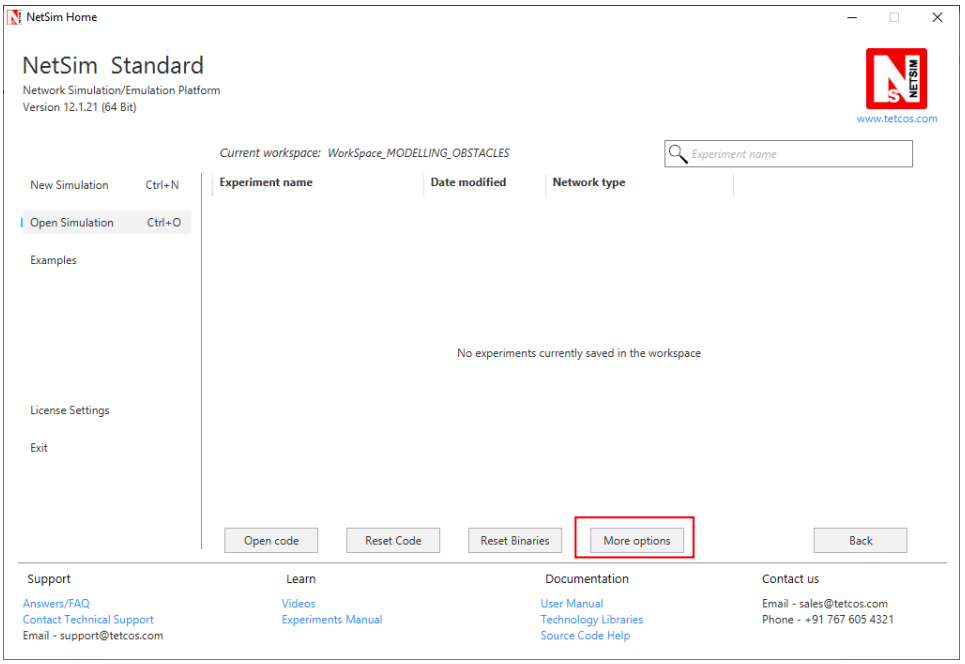
- After you unzip the downloaded project folder, Open NetSim Home Page click on **Open Simulation** option,



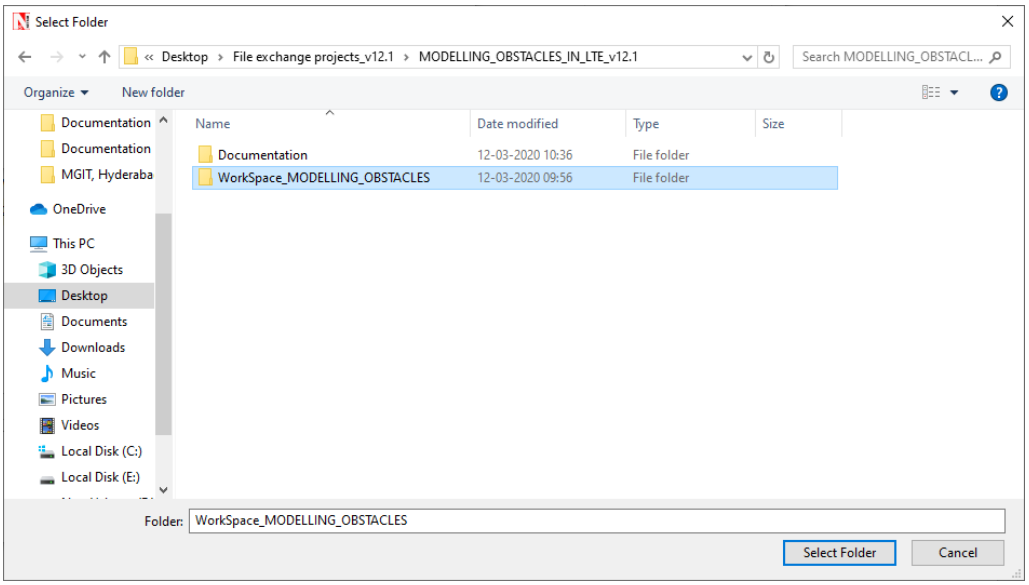
- Click on **Workspace options**



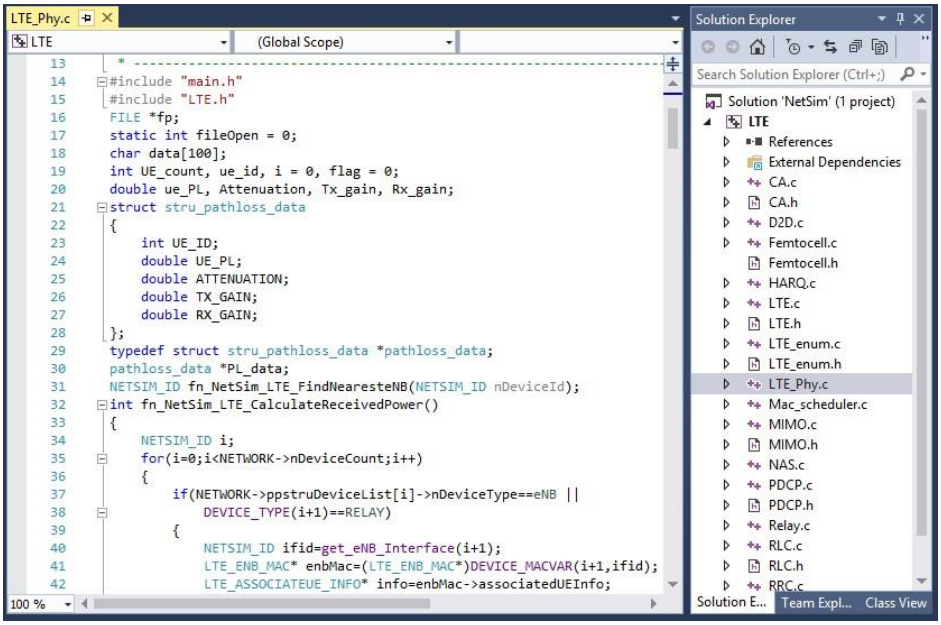
- Click on **More Options,**



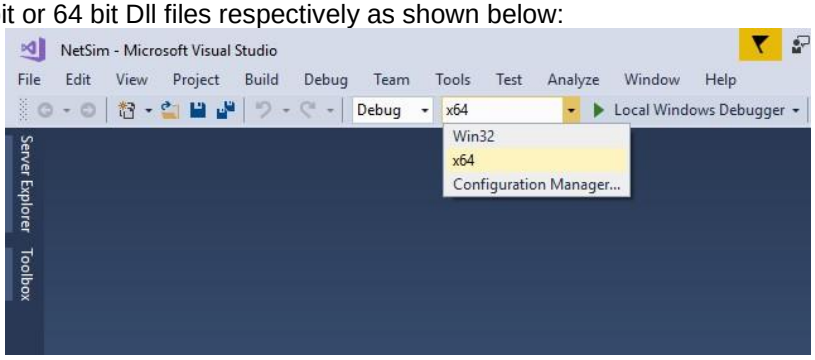
- Click on **Import**, browse the extracted folder path and go into WorkSpace_MODELING_OBSTACLES directory. Click on Select folder and then on **OK.**



- Go to NetSim Home Page, click on Open Simulation->Workspace Options and click on the Open Code button.



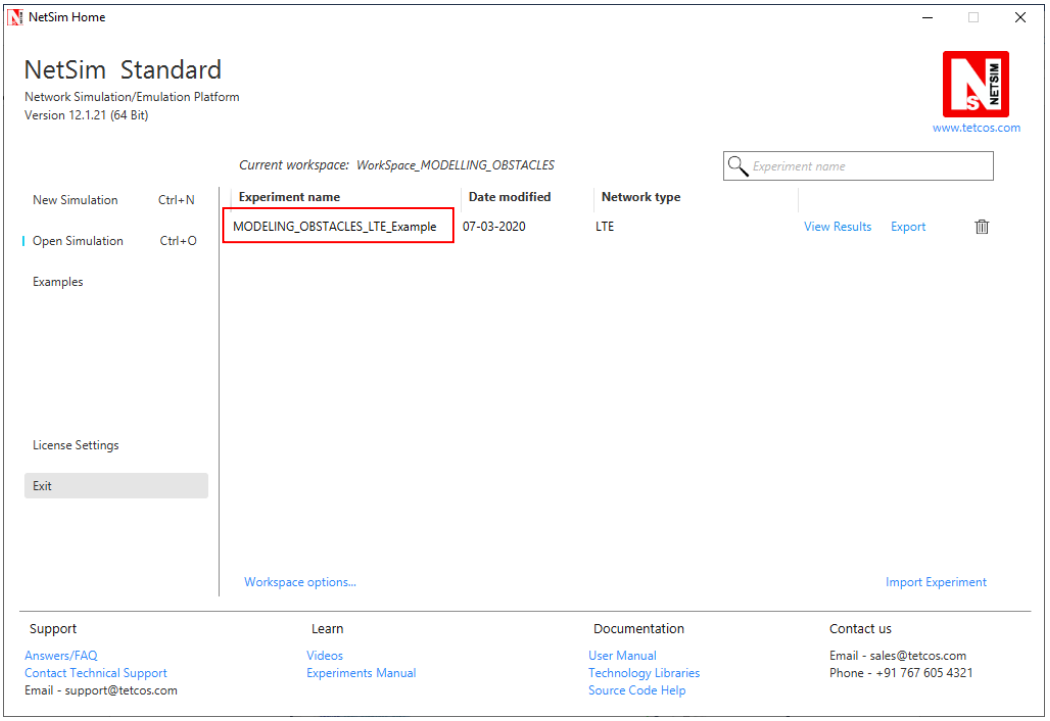
- Based on whether you are using NetSim 32 bit or 64 bit setup you can configure Visual studio to build 32 bit or 64 bit Dll files respectively as shown below:



1. Right click on Solution in Solution Explorer and select rebuild solution

2. Upon rebuilding, **libLTE.dll** will get created in the **bin_x86/ bin_x64** folder.

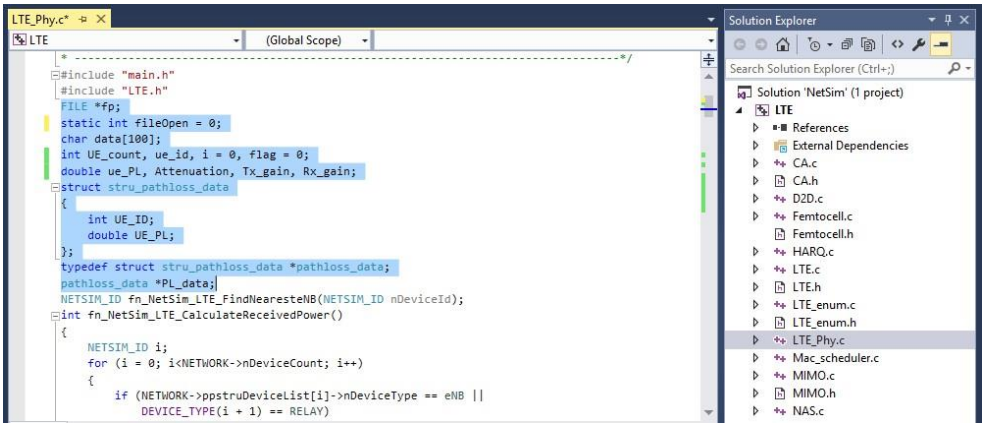
3. Go to NetSim home page, click on **Open Simulation**, Click on **MODELING_OBSTACLES_LTE_Experiment**.



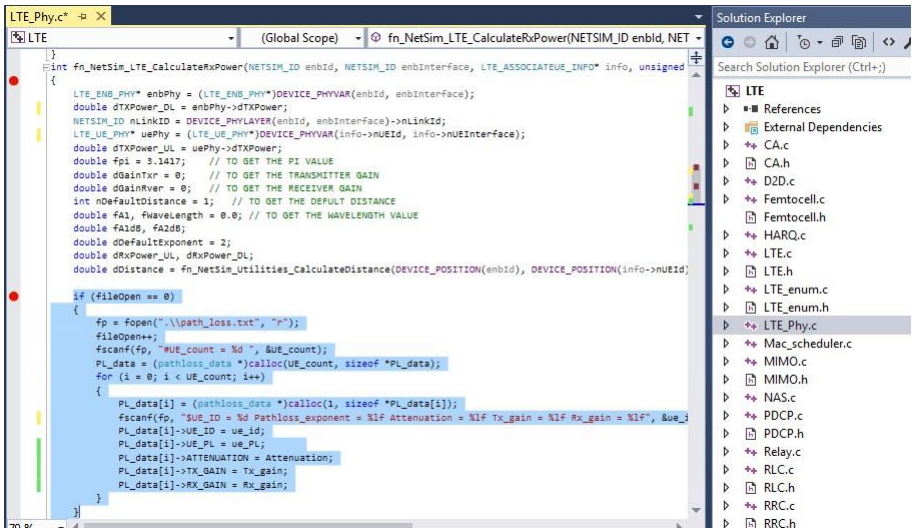
4. After simulation, note down the throughputs available in the metrics window.

Steps to be done in NetSim to configure different path loss exponents:

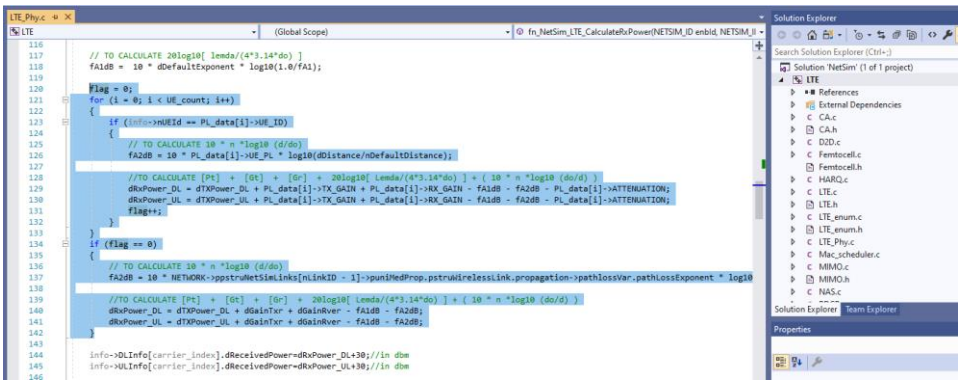
We have added the following lines of code in LTE_PHY.c file present inside LTE project as shown below:



To read the file content, we have added the following lines of code in fn_NetSim_LTE_CalculateRxPower() present in LTE_PHY.c file.



And then the following lines in fn_NetSim_LTE_CalculateRxPower() present in LTE_PHY.c file.



Create a path_loss.txt file and paste it in the install directory of NetSim would look something like **"C:\Program Files\NetSim\ Standard_v12_1\bin"** and the file format should be

#UE_count = 2

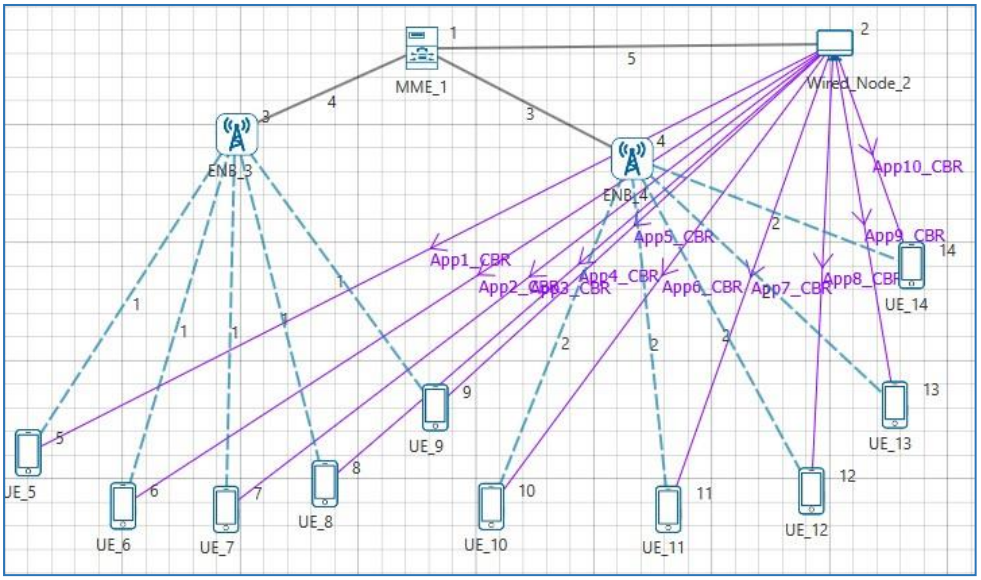
$UE_ID = 13 Pathloss = 4.7 Attenuation = 2 Tx_gain = 2 Rx_gain = 2

$UE_ID = 5 Pathloss = 4.7 Attenuation = 2 Tx_gain = 2 Rx_gain = 2

First line represents the number of UEs (whose path loss value needs to be changed). In the above sample, the numbers of UEs are 5. Second line represents UE id and the path loss exponent of particular UE link and so on.

Settings to be done to create the network scenario:

- Click and drop 1MME, 1 wired node, 2eNBs and 10UEs as per the below screenshot



- Create applications from wired node to all UEs with packet size 1460Bytes and Inter arrival Time 1168µs.
- Set channel characteristics as Path loss only, Path loss model as LOG DISTANCE and Path loss exponent to 3.5.

Results:

Without obstacles:

Application_Metrics_Table

Application_metrics Detailed View

Application Id	*Throughput Plot*	Application Name	Packet generated	Packet received	Throughput (Mbps)	Delay(microsec)	Jitter(microsec)
1	*Application throughput plot*	App1_CBR	42809	39988	9.341197	1082356.280684	607.134519
2	*Application throughput plot*	App2_CBR	42809	40097	9.366659	1081979.016685	631.105746
3	*Application throughput plot*	App3_CBR	42809	40102	9.367827	1083049.651588	562.271465
4	*Application throughput plot*	App4_CBR	42809	40109	9.369462	1083305.767982	535.901267
5	*Application throughput plot*	App5_CBR	42809	40362	9.428563	1084036.201972	476.200887
6	*Application throughput plot*	App6_CBR	42809	40101	9.367594	1082781.234583	608.785636
7	*Application throughput plot*	App7_CBR	42809	40177	9.385347	1083854.413620	629.526882
8	*Application throughput plot*	App8_CBR	42809	40149	9.378806	1084546.329124	563.955166
9	*Application throughput plot*	App9_CBR	42809	40401	9.437674	1086263.311106	543.382178
10	*Application throughput plot*	App10_CBR	42809	40446	9.448186	1082698.577264	437.618692

After simulation, note down the throughputs available in the simulation results window and compare with the previous results (Without Obstacles between UEs and eNB). Users can observe the change in throughputs

Application_Metrics_Table

Application_metrics Detailed View

Application Id	*Throughput Plot*	Application Name	Packet generated	Packet received	Throughput (Mbps)	Delay(microsec)	Jitter(microsec)
1	*Application throughput plot*	App1_CBR	42809	0	0.000000	0.000000	0.000000
2	*Application throughput plot*	App2_CBR	42809	40019	9.348438	1082034.892826	922.654605
3	*Application throughput plot*	App3_CBR	42809	40015	9.347504	1083357.917381	743.187484
4	*Application throughput plot*	App4_CBR	42809	40083	9.363389	1082902.827832	483.134774
5	*Application throughput plot*	App5_CBR	42809	40409	9.439542	1084003.455864	324.173629
6	*Application throughput plot*	App6_CBR	42809	40161	9.381610	1082708.595105	536.130279
7	*Application throughput plot*	App7_CBR	42809	40266	9.406138	1082724.943327	447.759593
8	*Application throughput plot*	App8_CBR	42809	40129	9.374134	1085375.429041	656.116627
9	*Application throughput plot*	App9_CBR	42809	33242	7.765331	9763939.933337	507.143828
10	*Application throughput plot*	App10_CBR	42809	40493	9.459165	1082694.793668	328.627482