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ADVANCED ELECTRONIC SOLUTIONS

AVIATION SERVICES

COMMUNICATIONS AND CONNECTIVITY

MISSION SYSTEMS

CN-006 OMM Configurations

June 2016



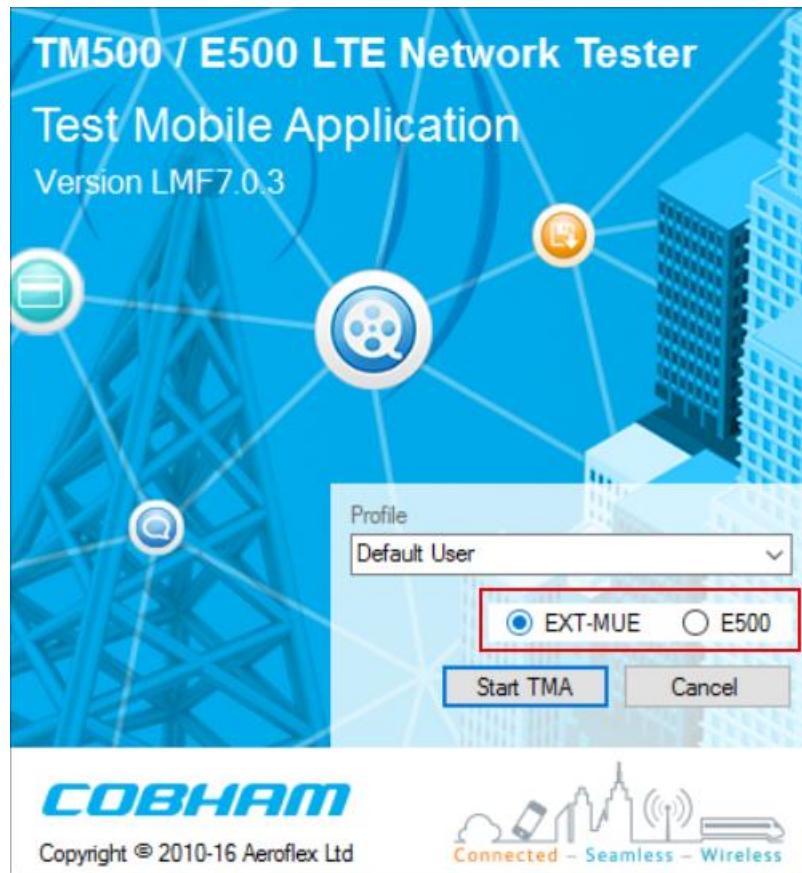
主要内容

- 远中近信道模型
- Handover信道模型



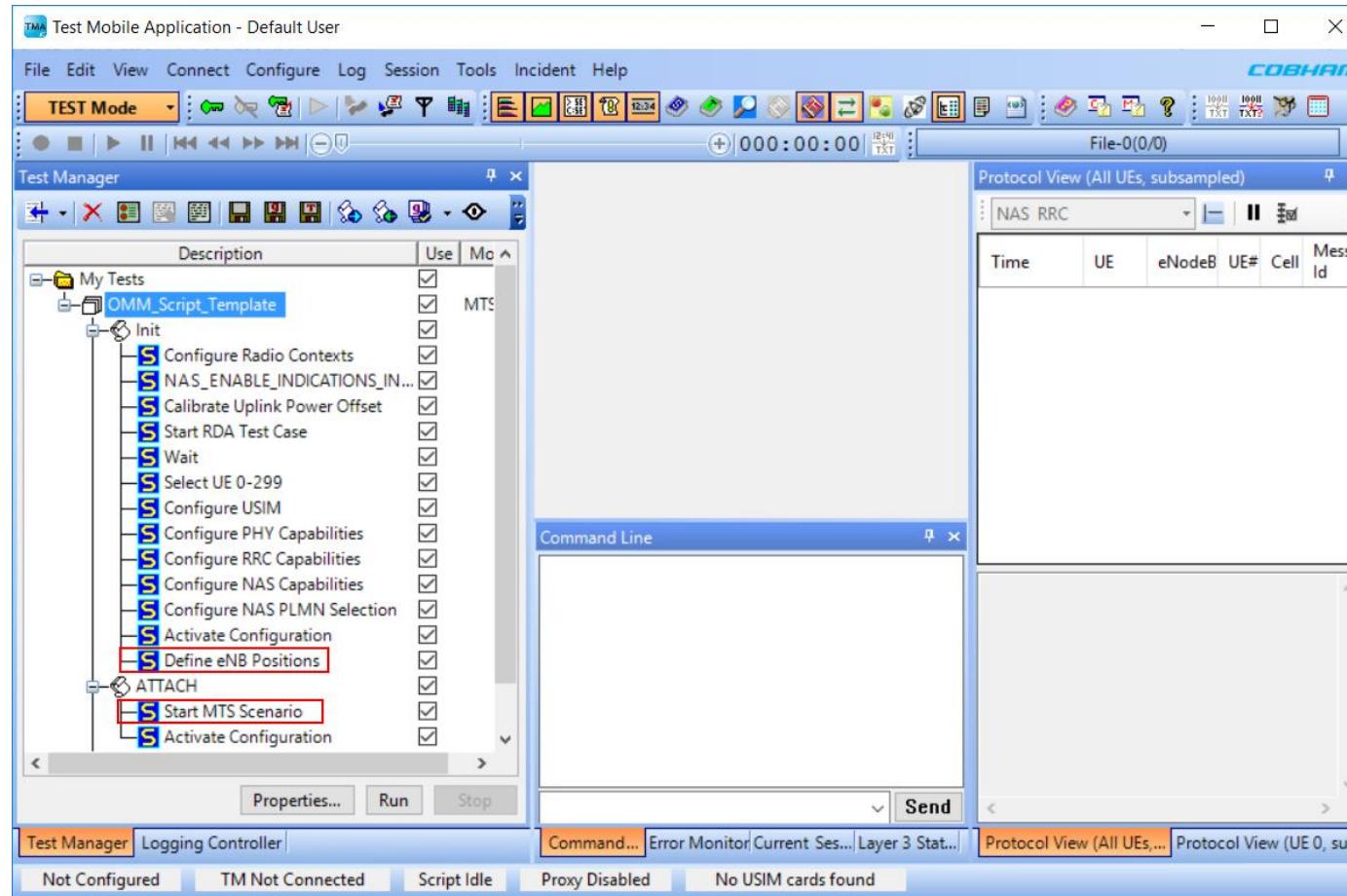
- TMA两种操作界面
 - EXT-MUE: 传统的界面，通过界面直接配置Online Mobility Model (OMM)相关的参数，但是无法预览RSRP/SINR/CQI等等。
 - E500: 直观的图形化配置界面，易于定义Online Mobility Model以及预览RSRP/SINR/CQI。
- 传统的EXT-MUE界面前应用相对广泛，本文档主要通过两个用例，介绍如何通过E500 GUI，获取OMM关键参数配置，用于EXT-MUE GUI脚本OMM相关的设置，以LMF7.0.3 TMA为例。
 - 远中近信道模型（静态UE）
 - 切换信道模型配置（动态UE）

- 打开TMA时，请根据测试需求，选择对应的TMA GUI.



EXT-MUE

- EXT-MUE GUI通过**Define eNB Positions & Start MTS Scenario**定义OMM相关参数。



EXT-MUE – Define eNB Positions

Define eNB Positions

eNBs	Id	X (m)	Y (m)
0	0	0	

Add Remove

Cells

Common Parameters

Antenna Gain	Antenna Model	Sector Rolloff (dB/degree)
0	Simple	3

Dedicated Parameters

Cell ID	DL Frequency (MHz)	Sector Start (degrees)	Sector End (degrees)	Cell Range (m)	Reference Signal Power (dBm)	Cell Range Rolloff (db/1000m)	Path Loss Frequency (MHz)
16	2585	0	360	30000	15	Range Escalati...	

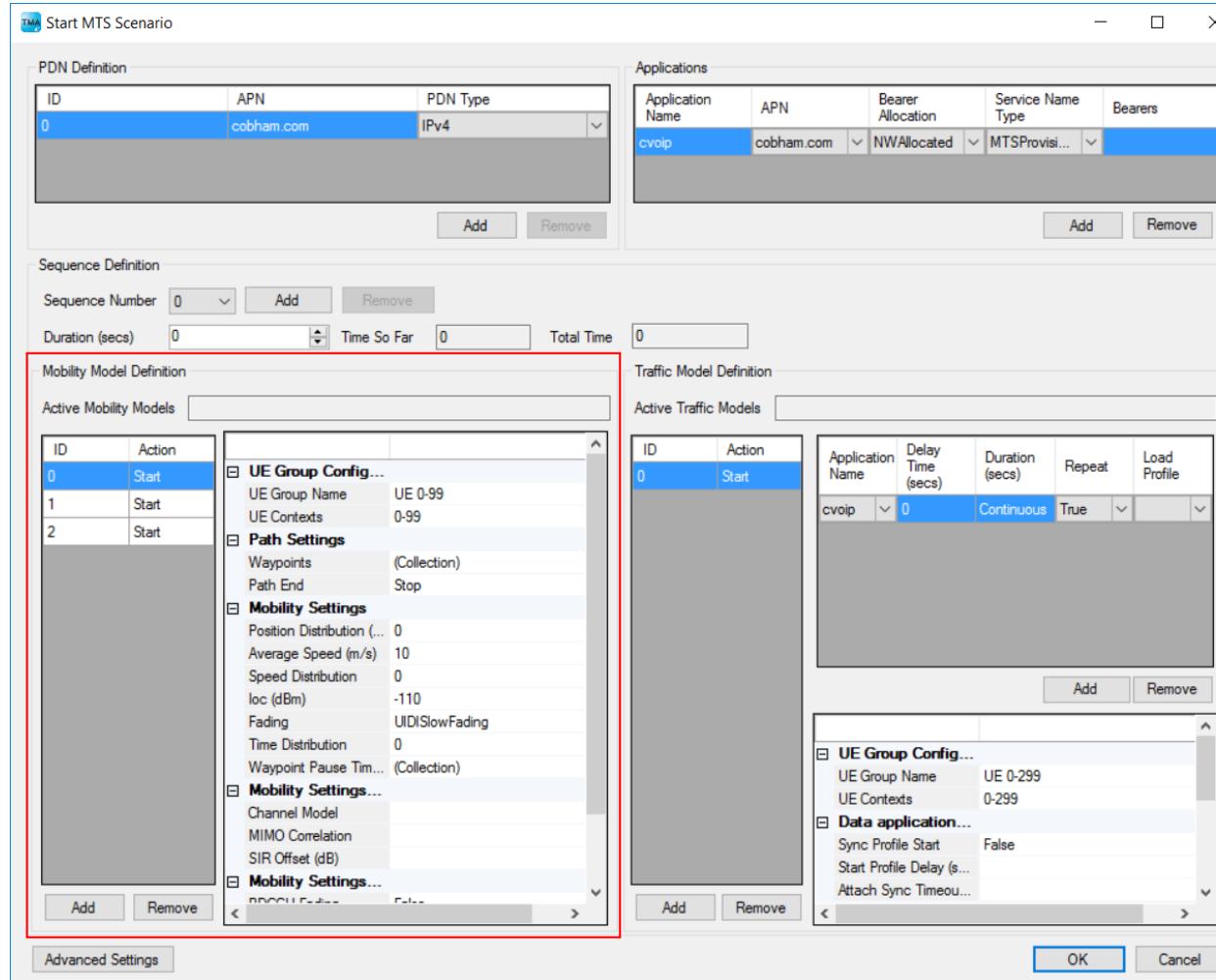
Add Remove Match Sector Sizes

Enhanced Measurement

OK Cancel

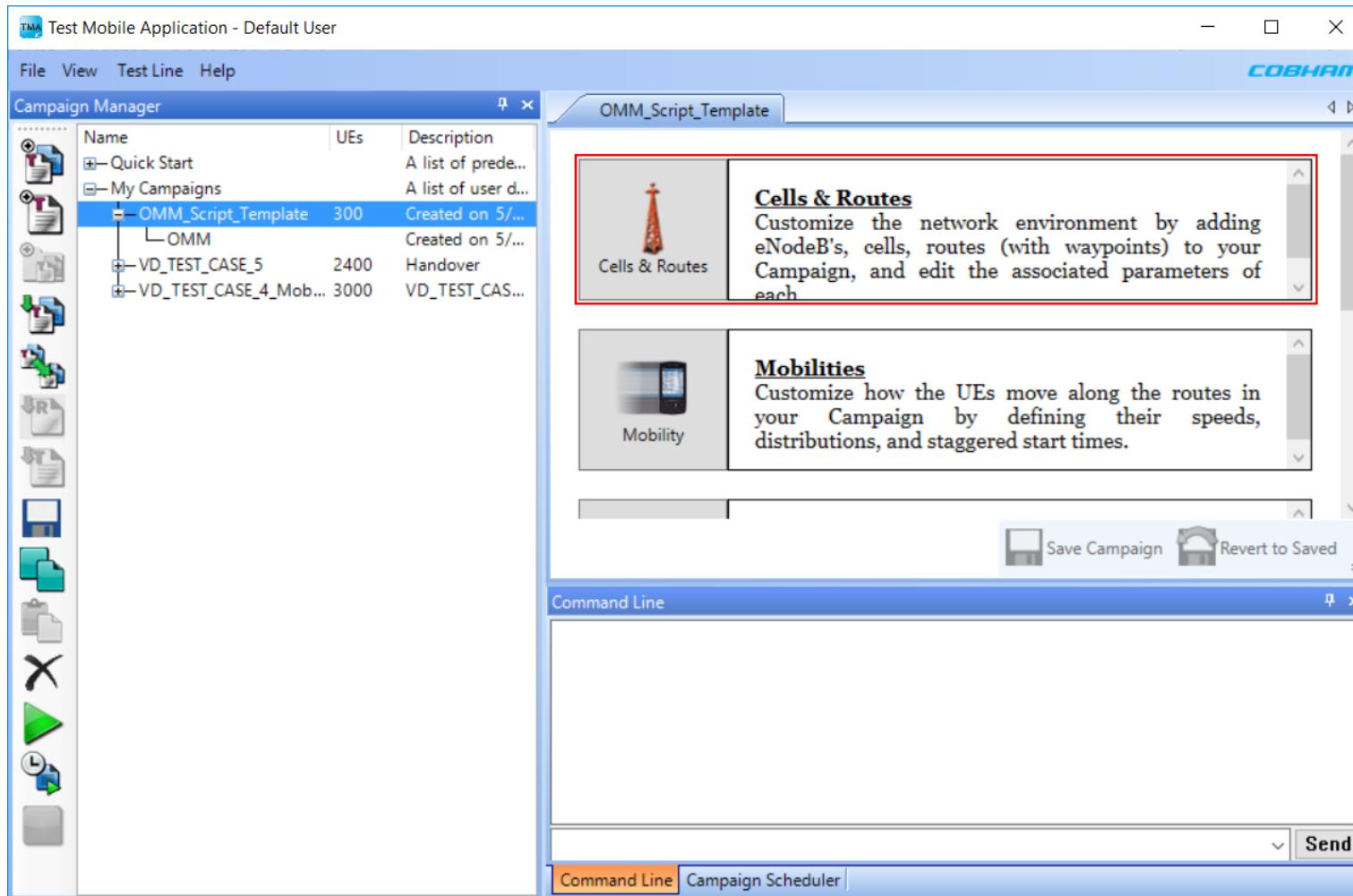
EXT-MUE – Start MTS Scenario

- Start MTS Scenario -> Mobility Model Definition

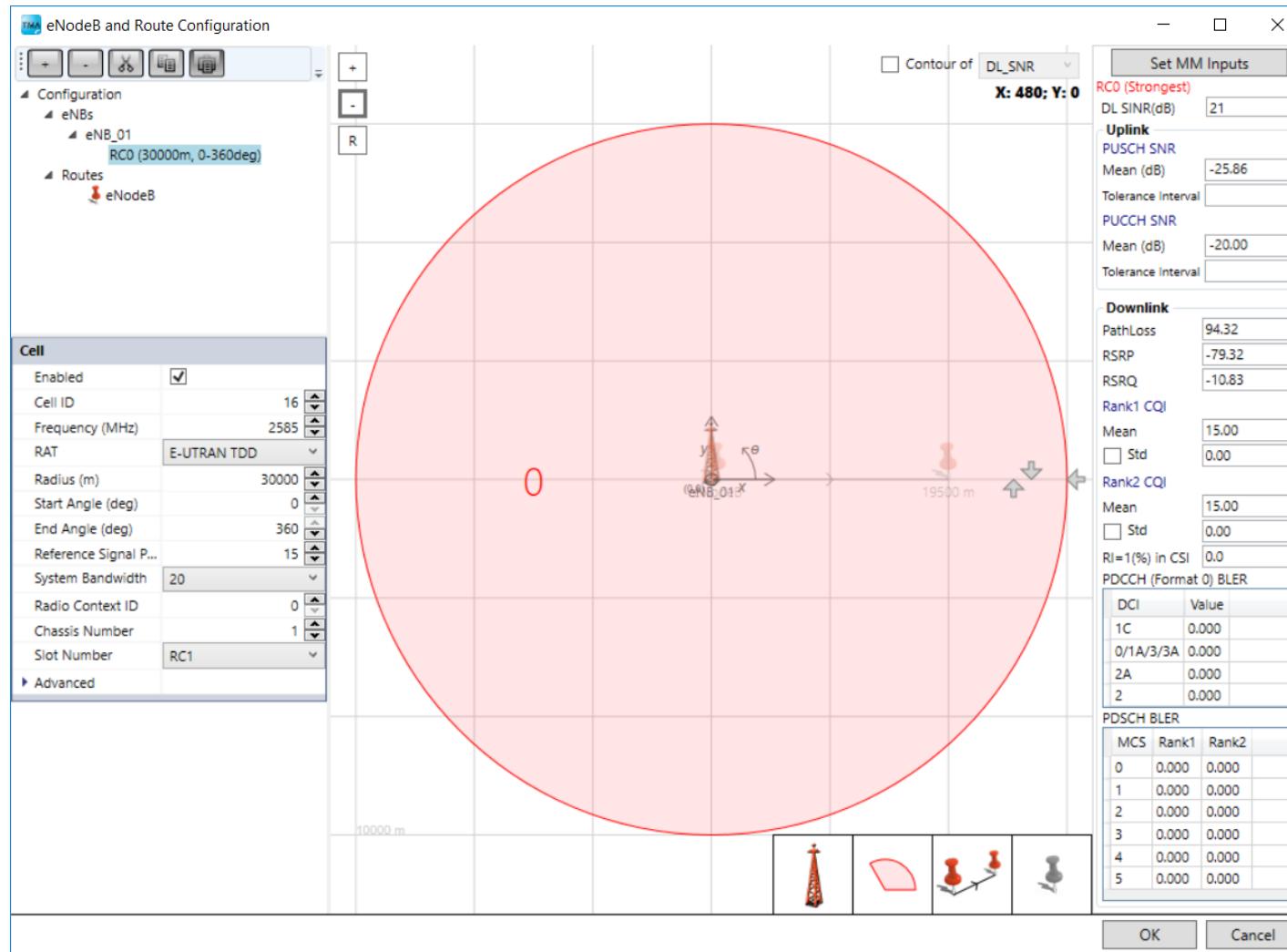


E500

- E500 GUI通过**Cells & Routes**定义OMM相关配置。



E500 – Cells & Routes



远中近信道模型



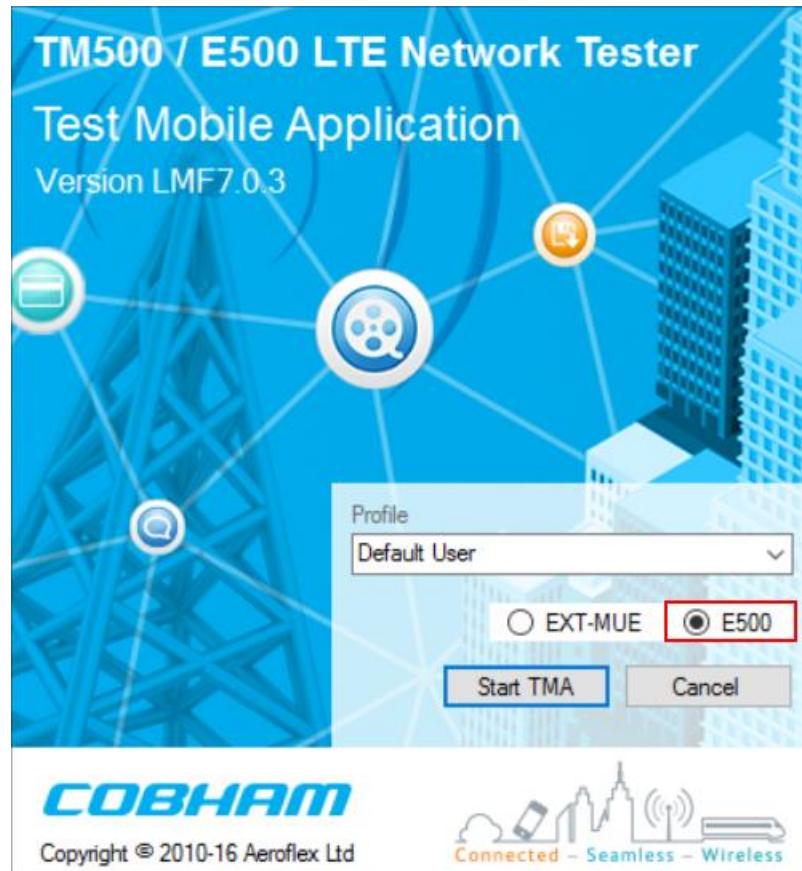
测试需求 & OMM参数配置

- RSRP/SINR
 - 近点: -80dBm/20dB
 - 中点: -100dBm/10dB
 - 远点: -112dBm/0dB
- 预知条件
 - 小区下行频率
 - 参考信号发射功率
- 通过E500 GUI, 获取如下OMM关键参数配置:
 - 远中近点对应eNB Position/Sector Start/End/Radius/Waypoint/Ioc

eNB Position (X, Y)	DL Frequency (MHz)	Sector Start	Sector End	Cell Range (m)	Reference Signal Power (dBm)
OMM	RSRP (dBm)	SINR (dB)	X (m)	Y (m)	Ioc (dBm)
近点	-80	20			
中点	-100	10			
远点	-112	0			

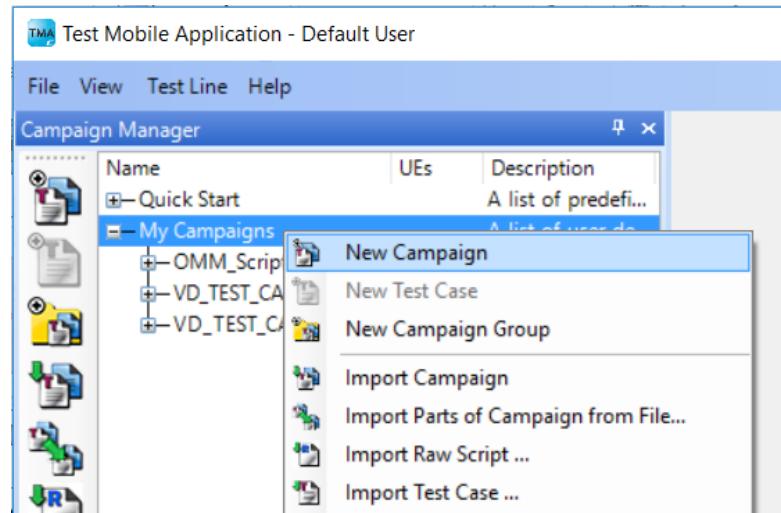
备注: *EXT-MUE GUI*的**Cell Range**等价于*E500 GUI*的**Radius**.

- 打开TMA，选择E500 GUI.



New Campaign

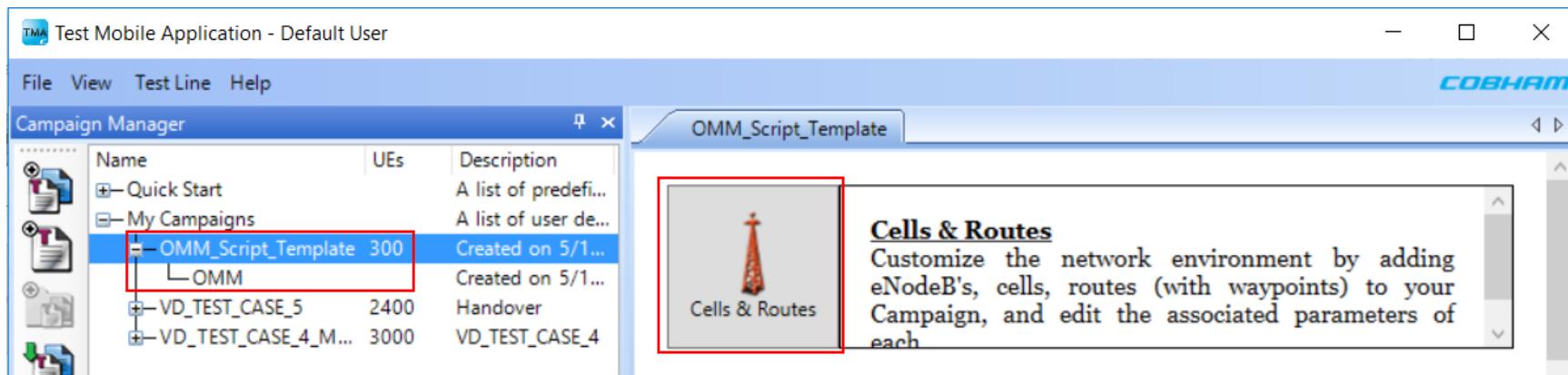
- 右键点击**My Campaigns**, 选择**New Campaign**, 建议及时更改默认的Campaign名字 (*NewCampaign*) , 以便于理解。



The screenshot shows the 'NewCampaign' configuration dialog. On the left, the 'Campaign Manager' tree view has 'NewCampaign' selected. On the right, the 'Cells & Routes' tab is active, displaying the text: 'Customize the network environment by adding eNodeB's, cells, routes (with waypoints) to your Campaign, and edit the associated parameters of each'. There is also a small icon of a cell tower.

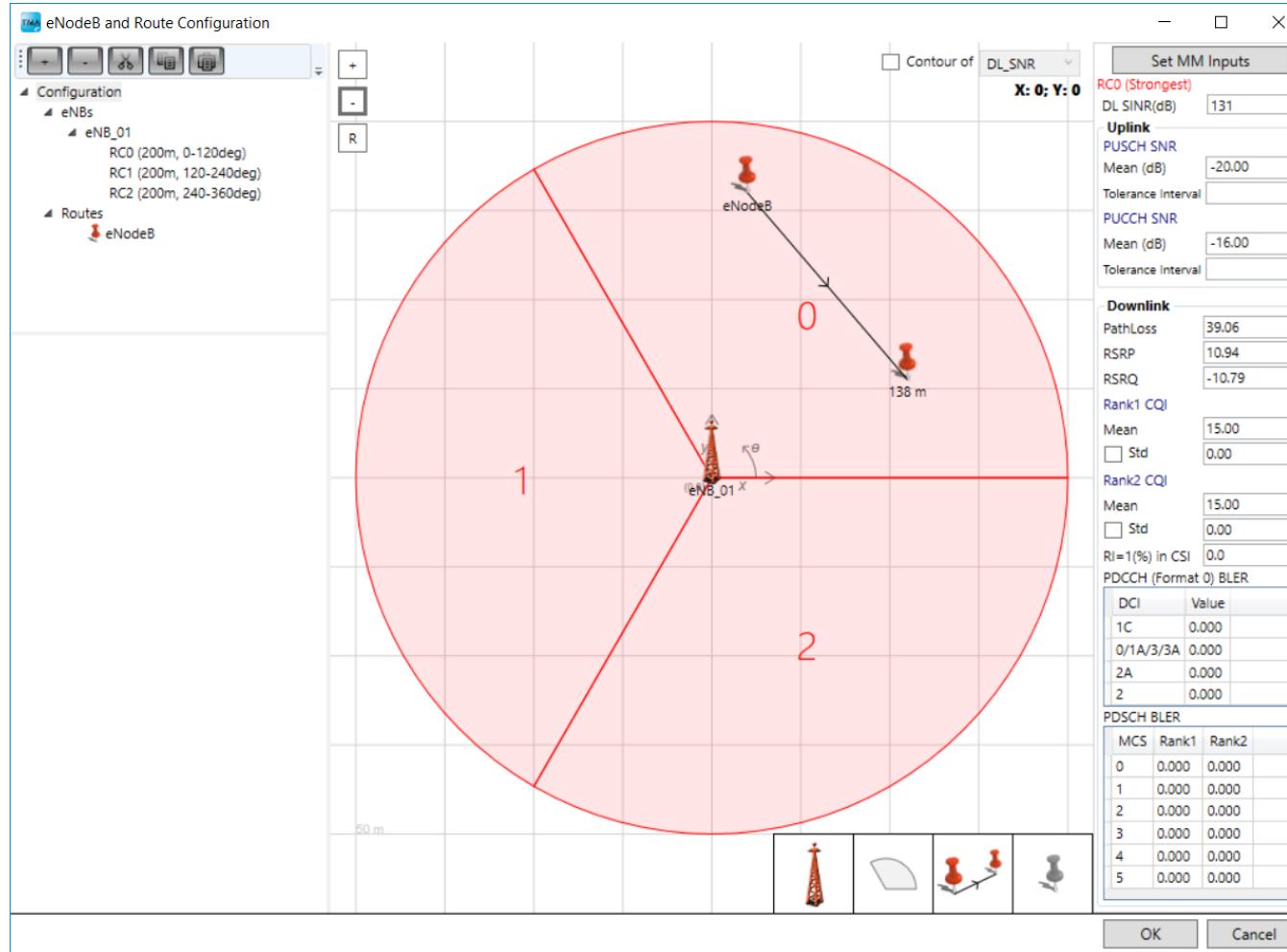
Cells & Routes

- 选中Campaign (例如*OMM_Script_Template*) , 点击**Cells & Routes**, 打开eNB and Route Configuration.



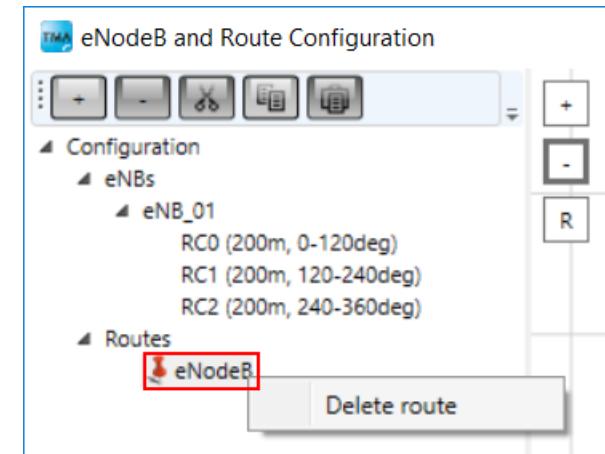
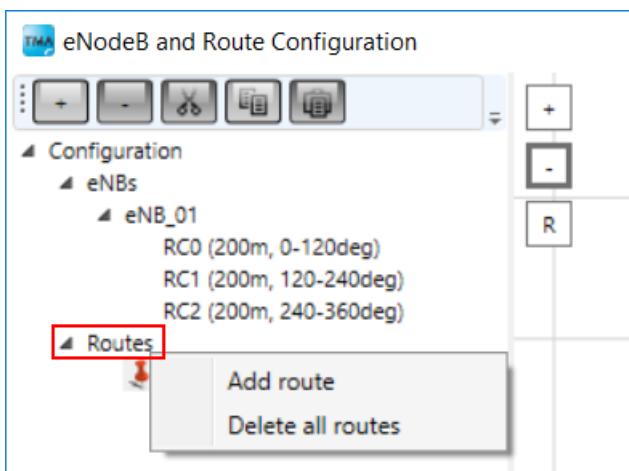
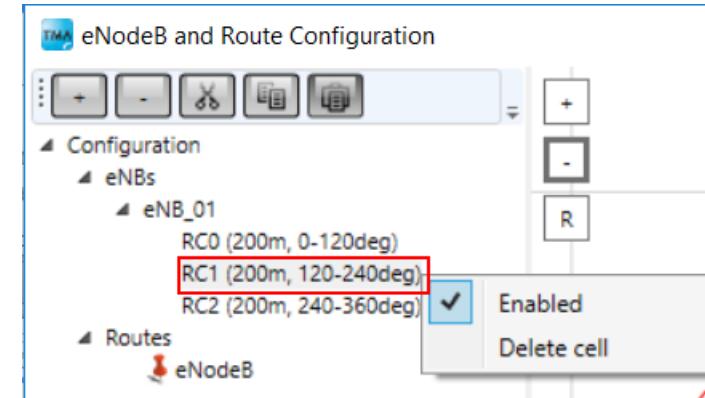
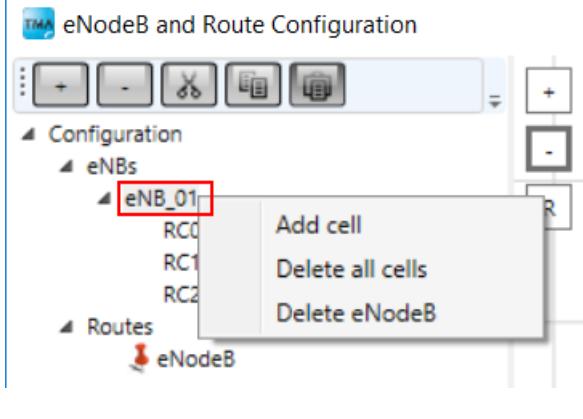
eNodeB and Route Configuration

- 默认配置如下，请根据测试需求，增加或删除eNB/Cell/Routes.



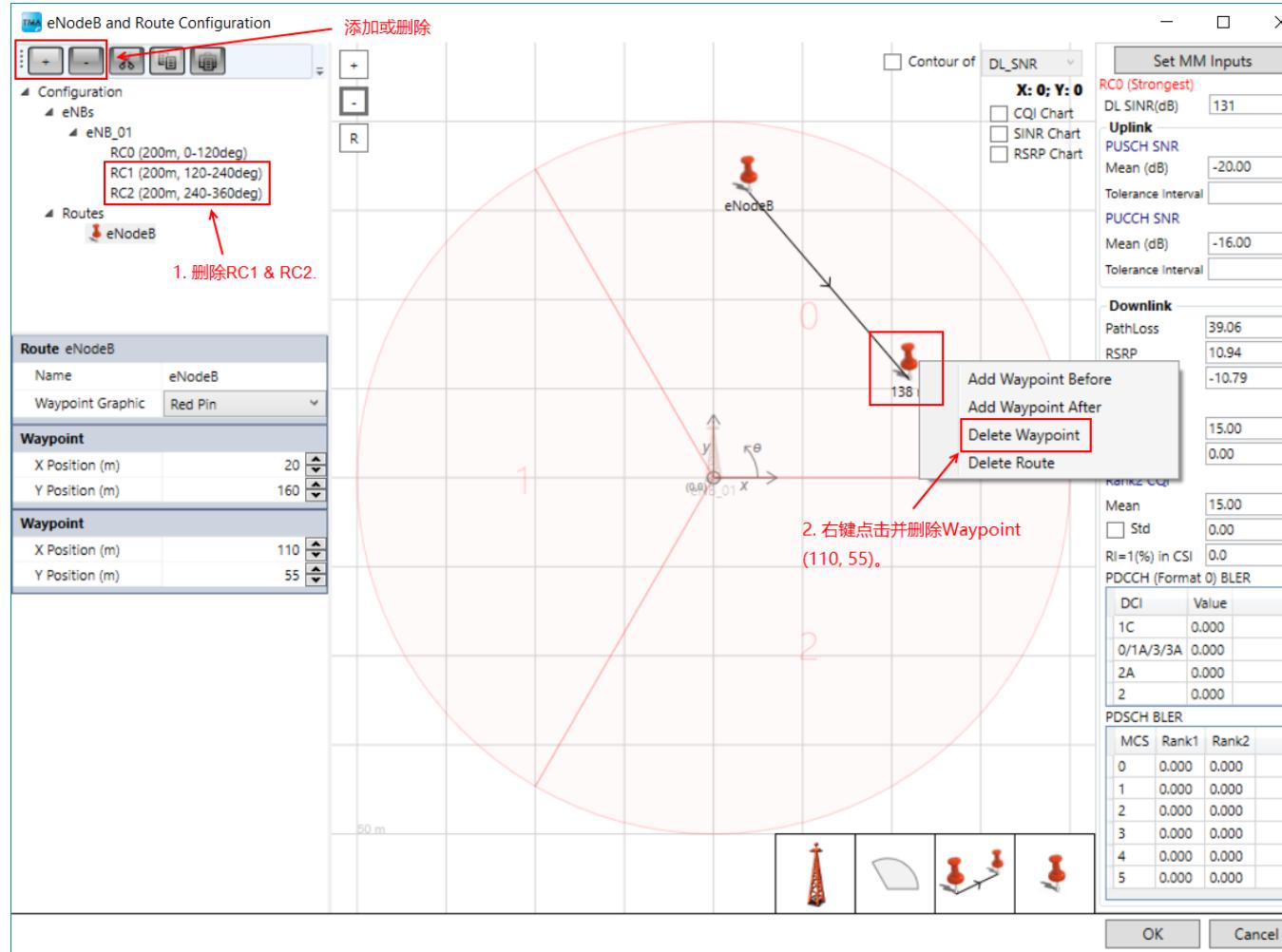
eNodeB and Route Configuration

- 右键点击即可增加或删除eNB/Cell/Routes.



eNodeB and Route Configuration

- 删除默认配置的RC1, RC2以及Waypoint (110, 55).



eNodeB and Route Configuration

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配置小区参数

- 定义**eNB_01**的位置（**X & Y**），EXT-MUE GUI对应的配置项如图所示。

The screenshot shows two software interfaces for configuring network nodes.

E500 GUI: This interface is titled "eNodeB and Route Configuration". It has a toolbar with icons for adding, deleting, and editing. A tree view on the left shows a hierarchy: Configuration > eNBs > eNB_01 (RC0 (200m, 0-120deg)) and Routes > eNodeB. On the right, there's a grid area with a single row labeled "R". Below this is a detailed configuration window for "eNodeB" with fields for "Name" (eNB_01), "X Position (m)" (0), and "Y Position (m)" (0). The "X Position (m)" field is highlighted with a red border.

EXT-MUE GUI: This interface is titled "Define eNB Positions". It shows a table with columns "Id", "X (m)", and "Y (m)". There is one entry for "Id" 0 with "X (m)" and "Y (m)" both set to 0. The "X (m)" and "Y (m)" columns are highlighted with a red border. At the bottom are "Add" and "Remove" buttons.

配置小区参数

- 选择小区，请根据测试环境和测试需求，更新如下配置
 - Frequency
 - Radius
 - Start Angle/End Angle
 - Reference Signal Power
 - Sector Rolloff/Cell Range Rolloff（可采用默认值或根据需求做微调）

(>>> Sector Rolloff)]	Int	0	5	0
Power rolloff at the sector edge in dB/degree. 0 = No power beyond the designated sector edge.				
[>>> referenceSignalPower]	Int	-60	50	50
In dBm The DL reference signal power transmitted by the eNB. Equivalent to the downlink reference-signal EPRE as defined in 36.213 and referenceSignalPower in 25.331.				
[>>> Cell Range Rolloff]	Int	-1, 1	100	Range Escalation
Defines the power rolloff in dB per 1000 meters when the specified cell edge is range -1 = set to minimum power immediately. The minimum value is -200 dBm. Range escalation is the default behavior. See the description of the 'Cell Range' parameter for more details.				

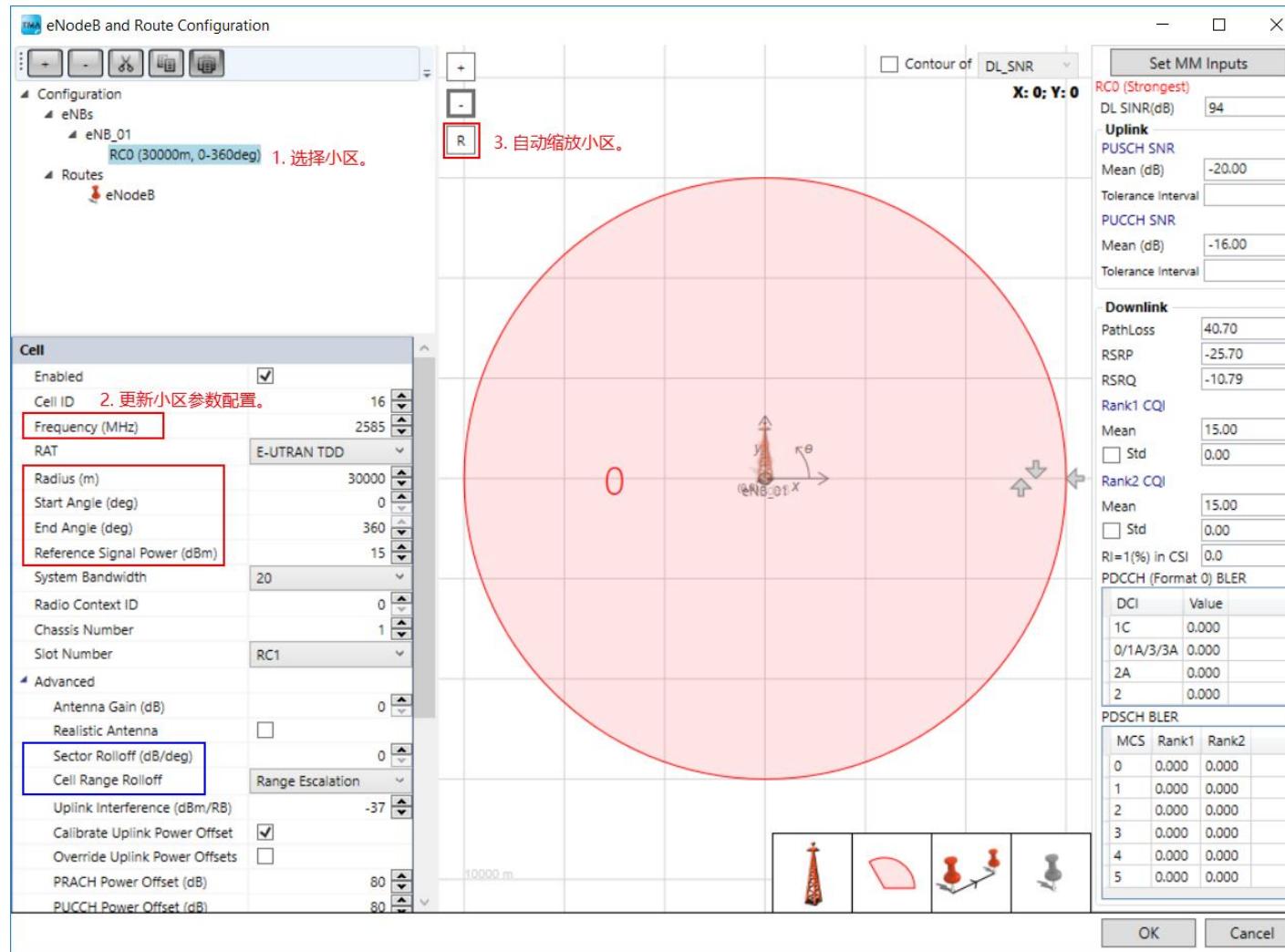
配置小区参数

>> Cell Range	Int	0	100000	
<p>Maximum cell range in meters If set to '0' then the range is considered infinite. Used to set a limit for considering the cell in measurement calculations.</p> <p>Note: When a UE exceeds the configured cell range the default behavior is for range escalation to be applied as described below. Alternatively the optional 'Cell Range Rolloff' parameter can be used to precisely control the rate at which the power decreases with increasing range. With range escalation a weighting factor of 250 is applied to delta distance beyond the cell range to determine an 'effective' UE range and then this 'effective' range is used to calculate the path loss and measurements as normal. When the UE is within the cell range the 'effective' UE range = UE range. When the UE range exceeds the cell range the 'effective' range = ((UE range – Cell range) * 250) + Cell range For example: If the cell range is configured to be 1000 m: if UE range = 1002 m, the 'effective' range = 1500 m if UE range = 1004 m, the 'effective' range = 2000 m if UE range = 1010 m, the 'effective' range = 3500 m if UE range = 1020 m, the 'effective' range = 6000 m</p>				

eNodeB and Route Configuration

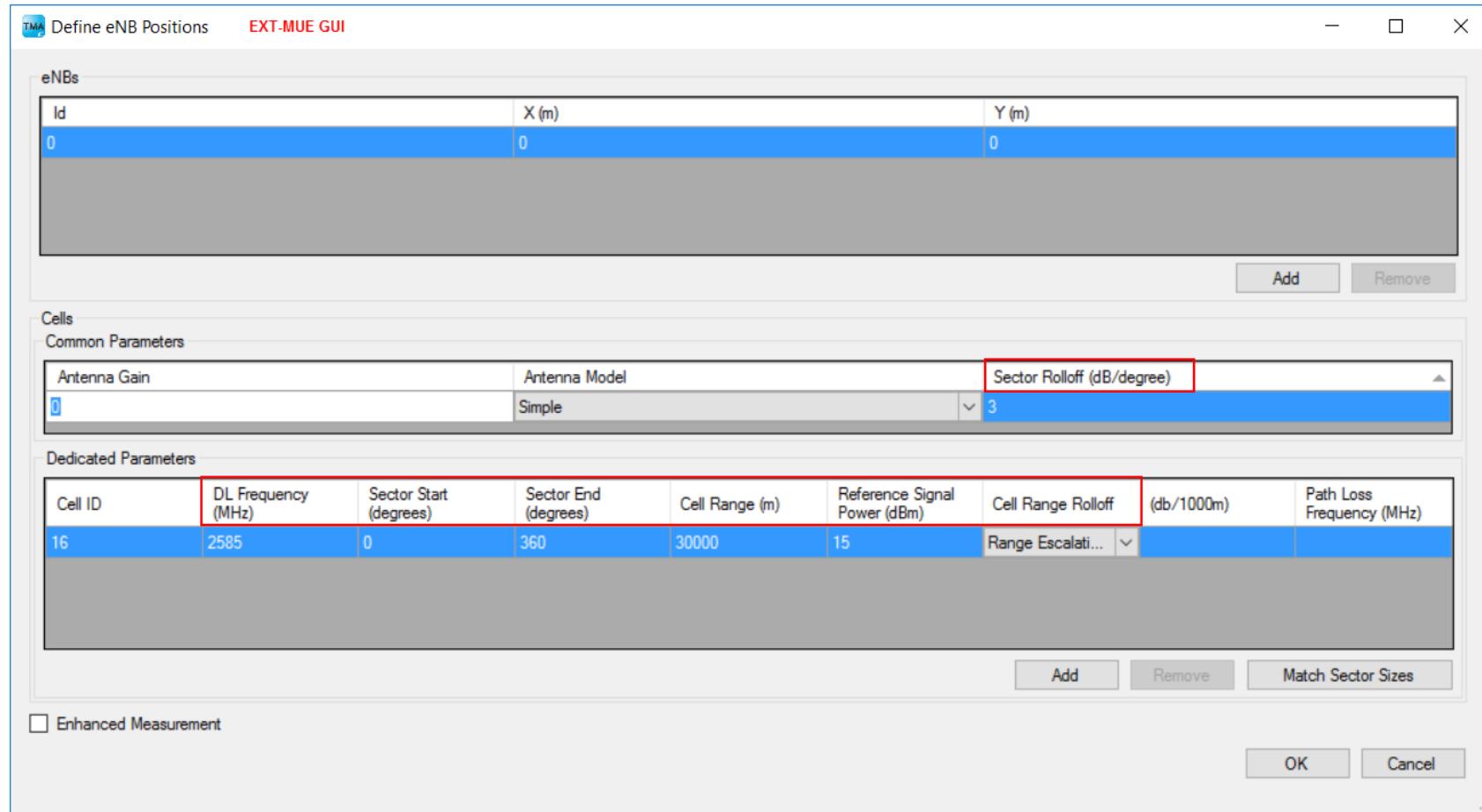
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配置小区参数



EXT-MUE GUI – Define eNB Positions

- EXT-MUE GUI对应的配置项如下图所示。

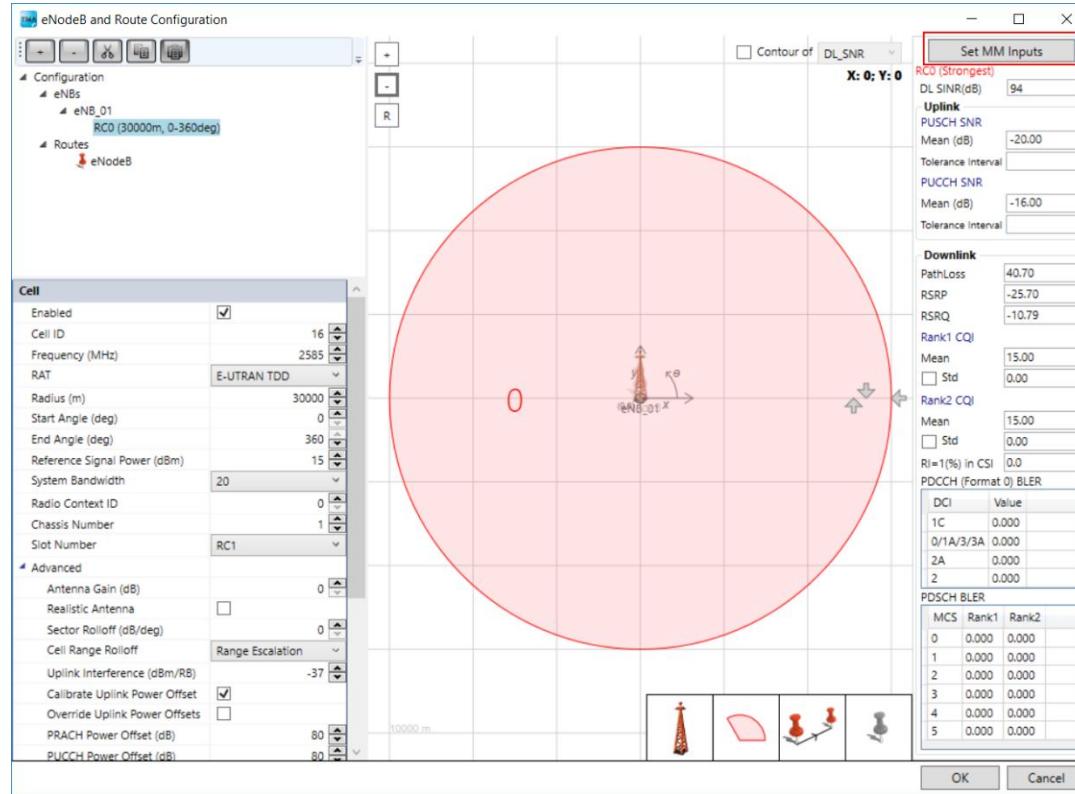


Set MM Inputs

- 点击右上角**Set MM Inputs**, 主要更新如下配置

– Channel Profile: AWGN

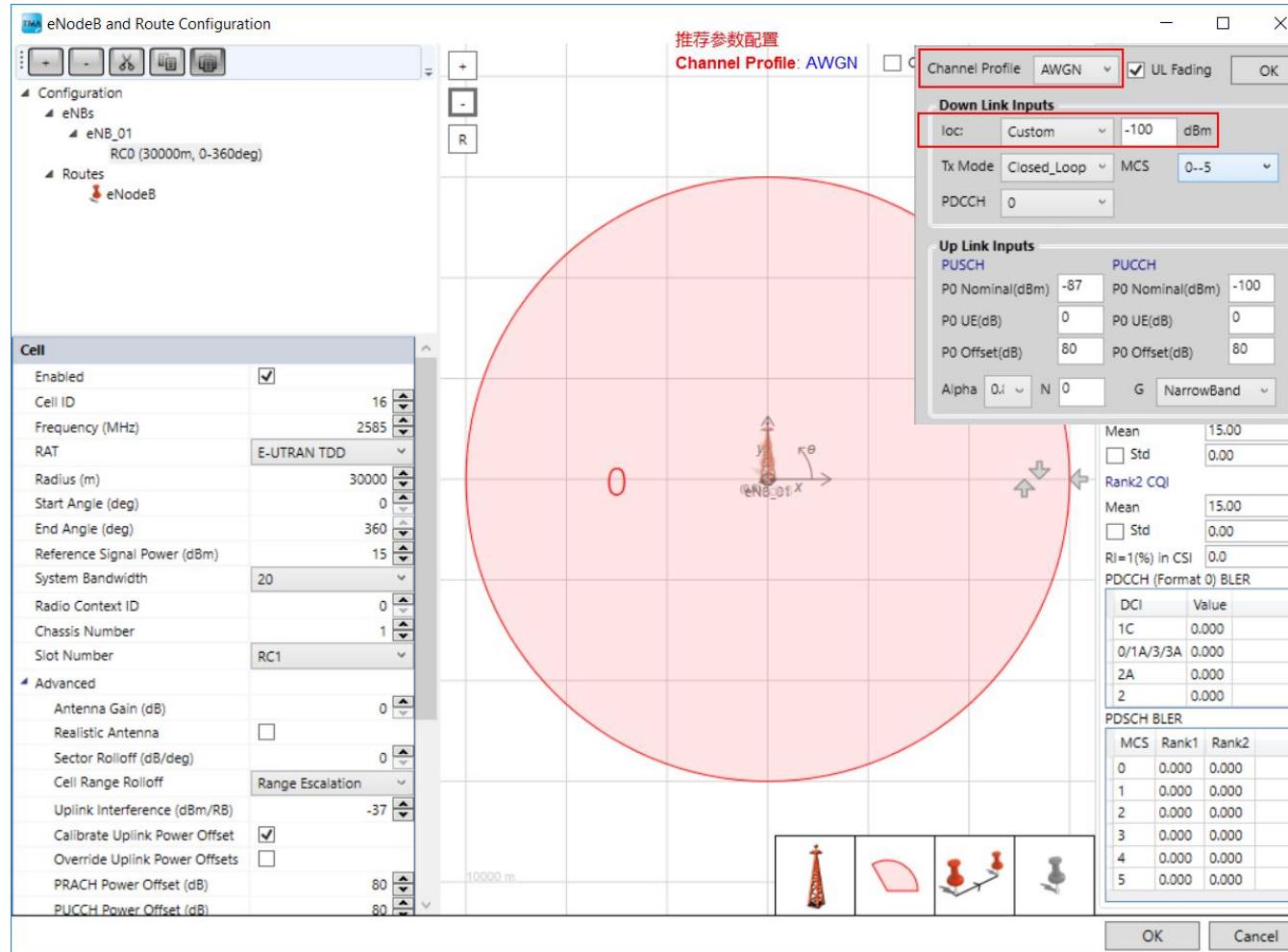
– I_{oc}: 下行底噪, $I_{oc} = RSRP - SINR$ 。在给定RSRP的前提下, 可以通过微调底噪, 模拟不同的SINR.



设置近点信道模型

Set MM Inputs

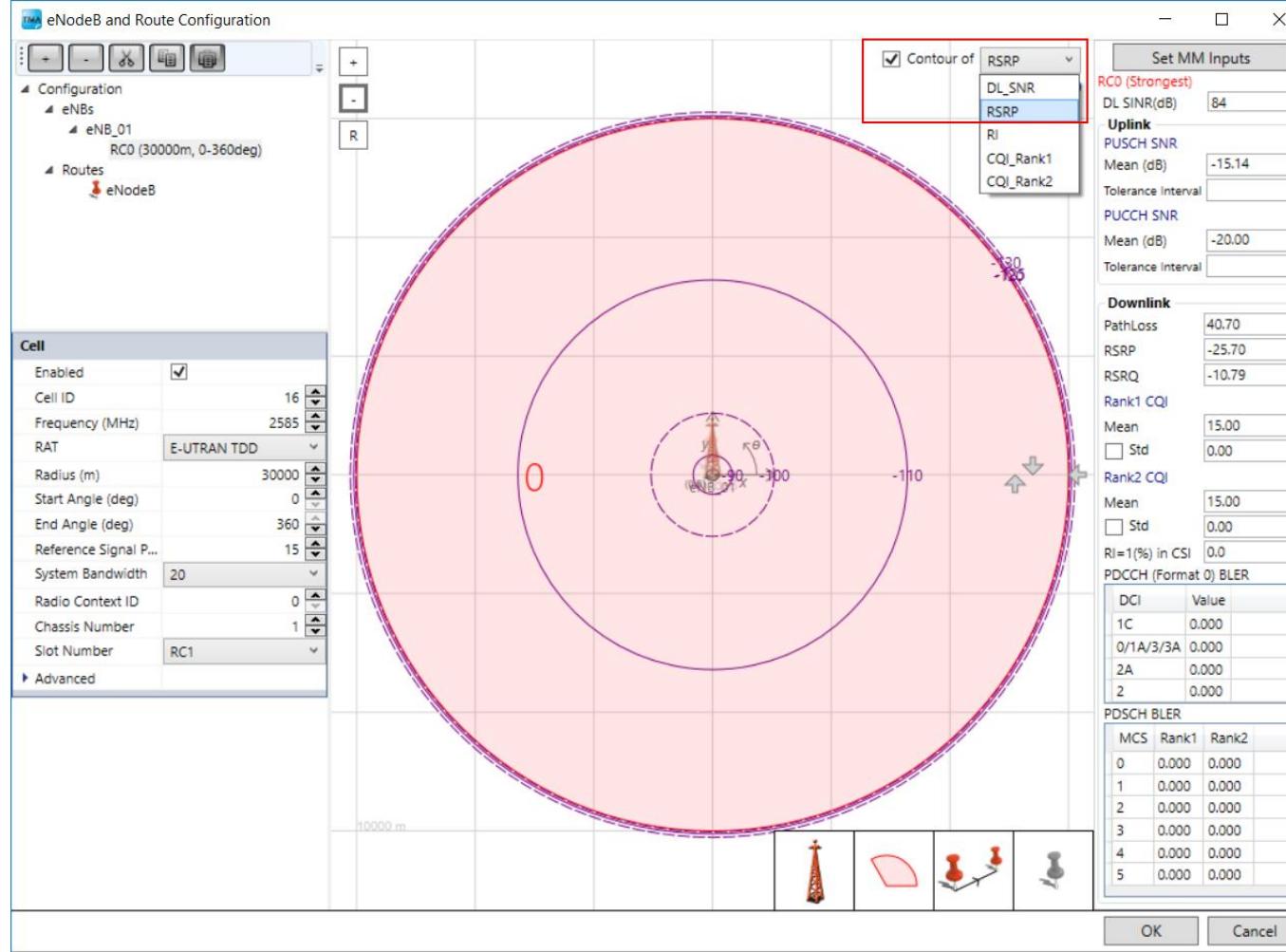
- 近点 $I_{loc} = RSRP - SINR = -80dBm - 20dB = -100dBm$



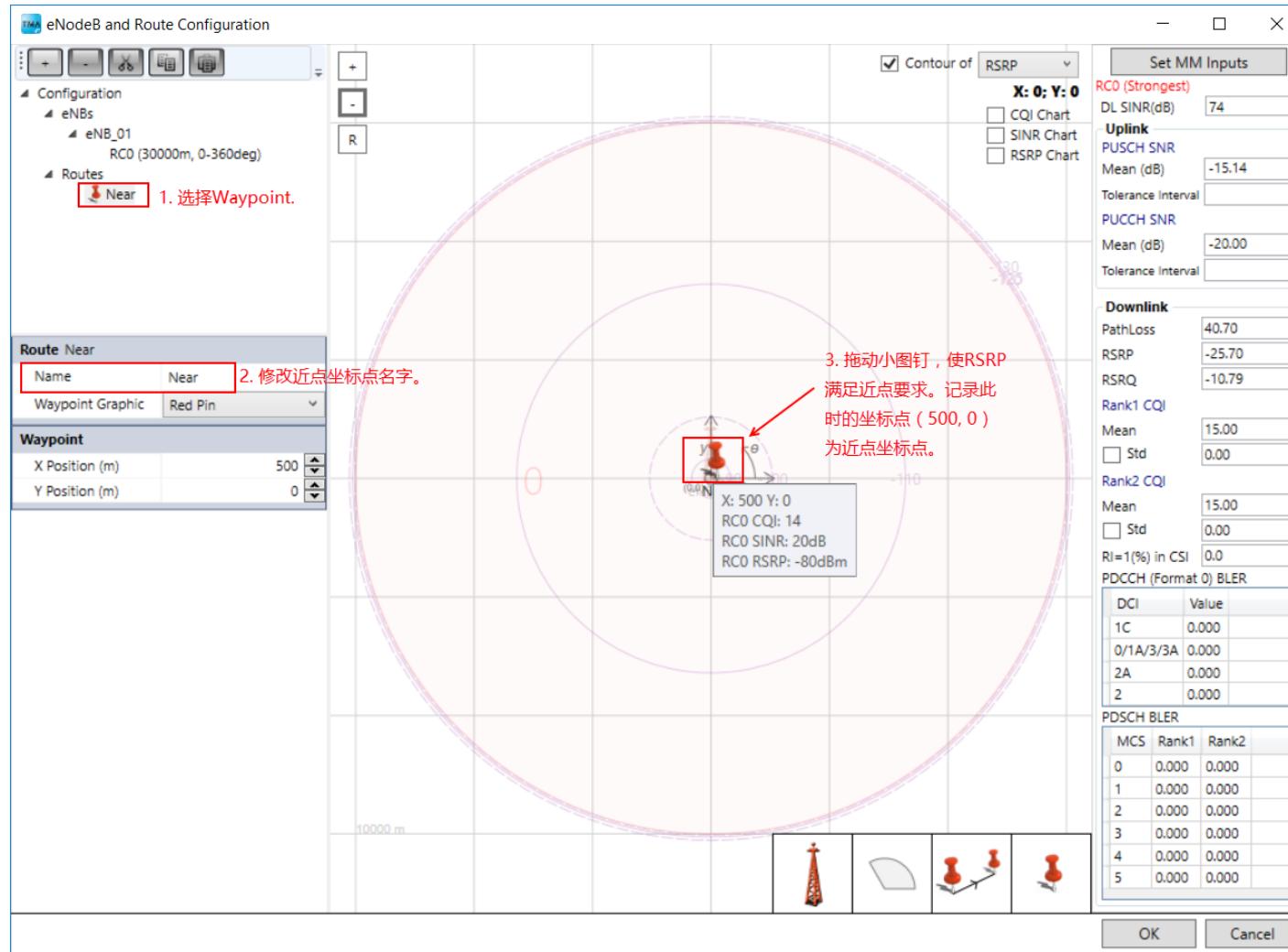
设置近点信道模型

打开RSRP Contour

- 勾选**Contour of**并选择**RSRP**, 界面将展现不同RSRP的等值线,



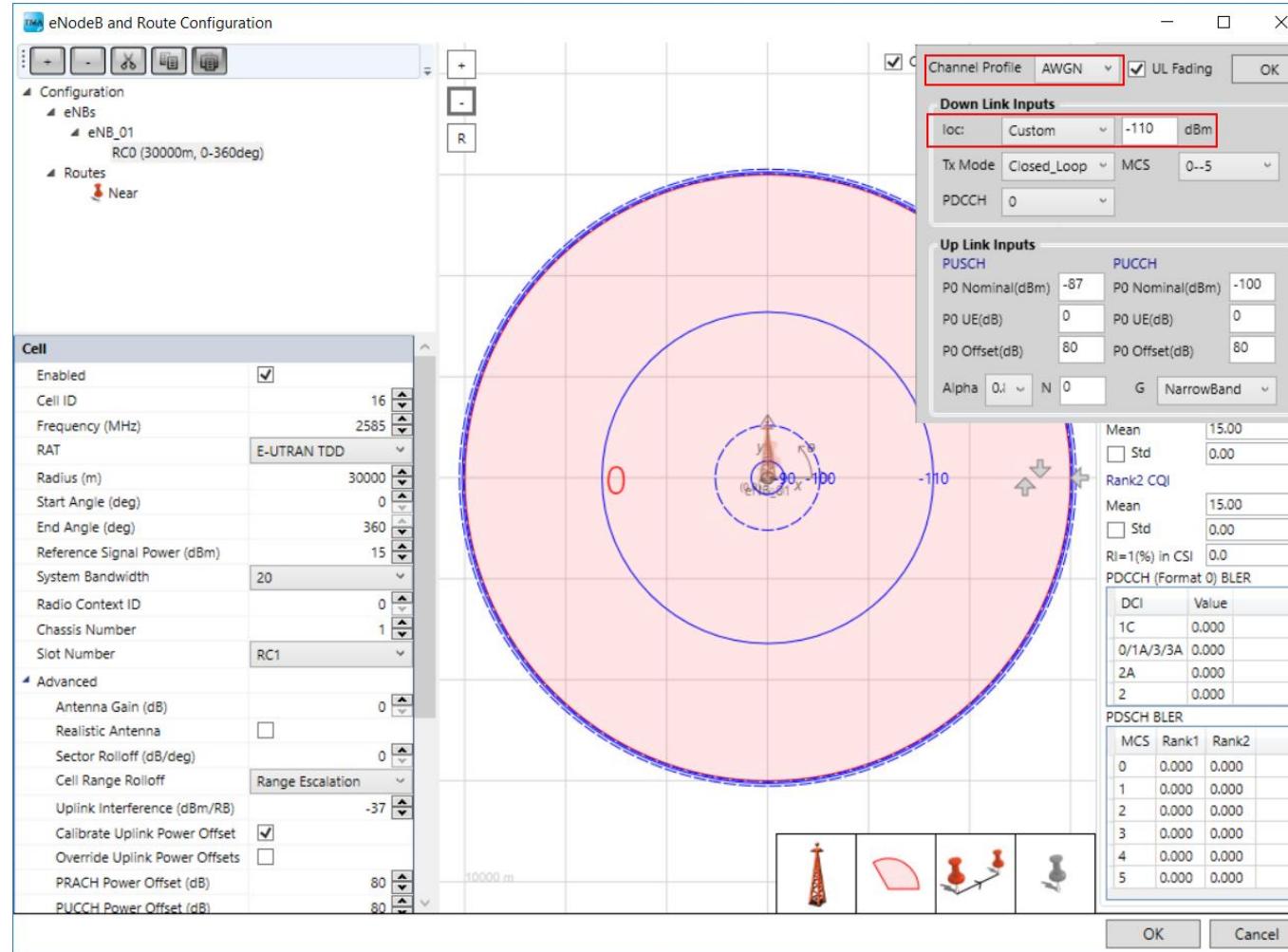
设置近点信道模型



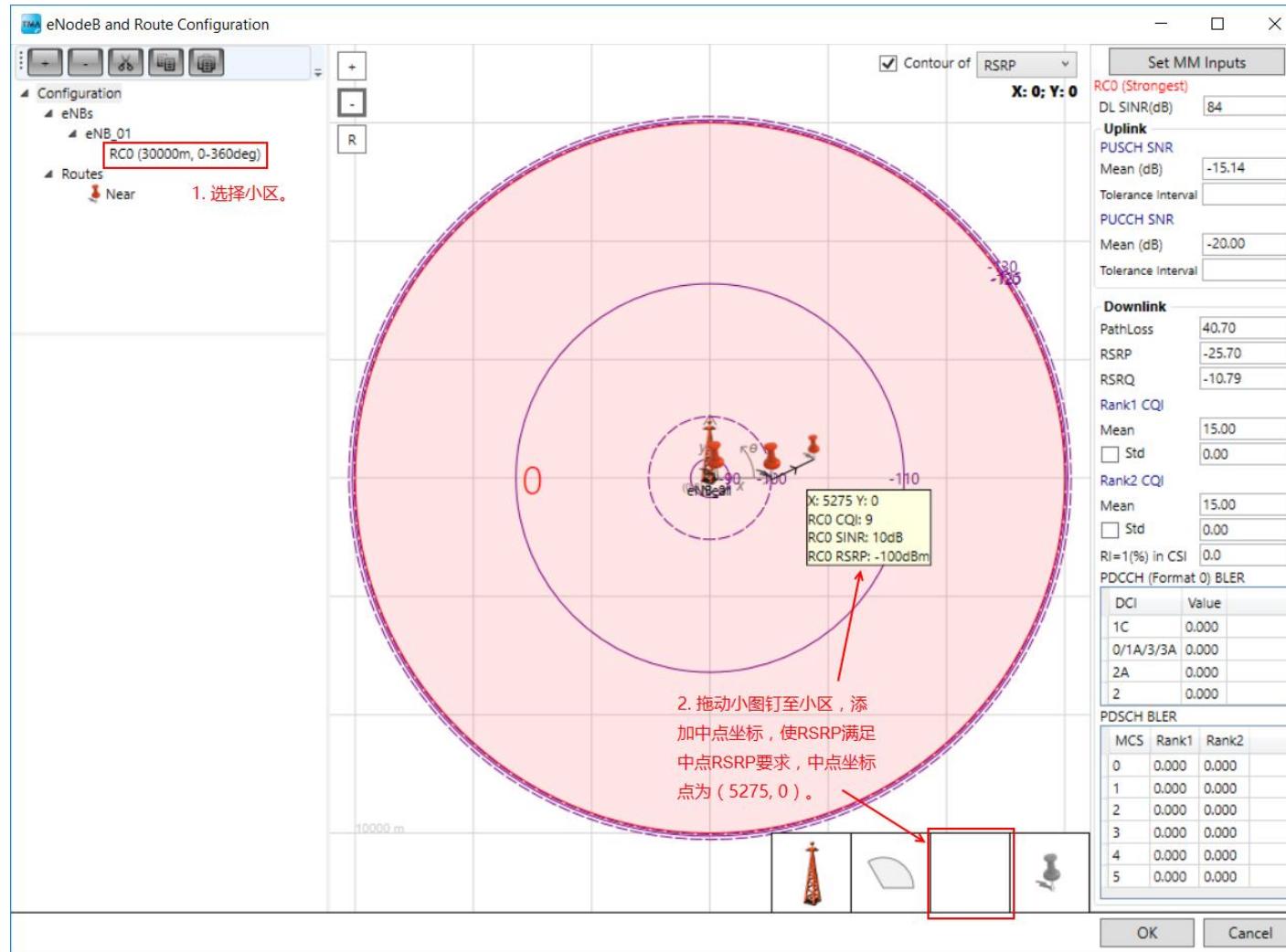
设置中点信道模型

Set MM Inputs

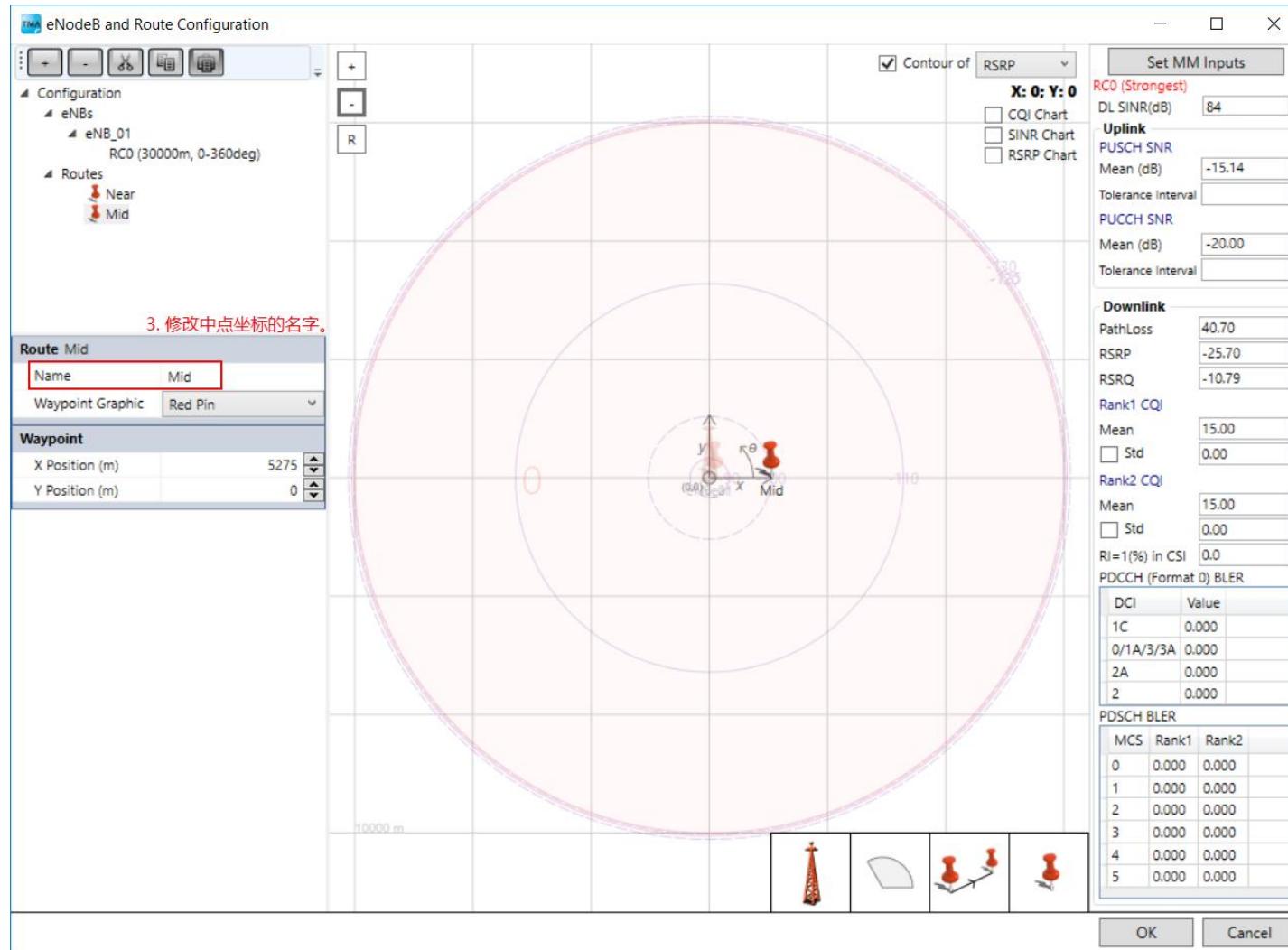
- 中点 $I_{loc} = RSRP - SINR = -100dBm - 10dB = -110dBm$



设置中点信道模型



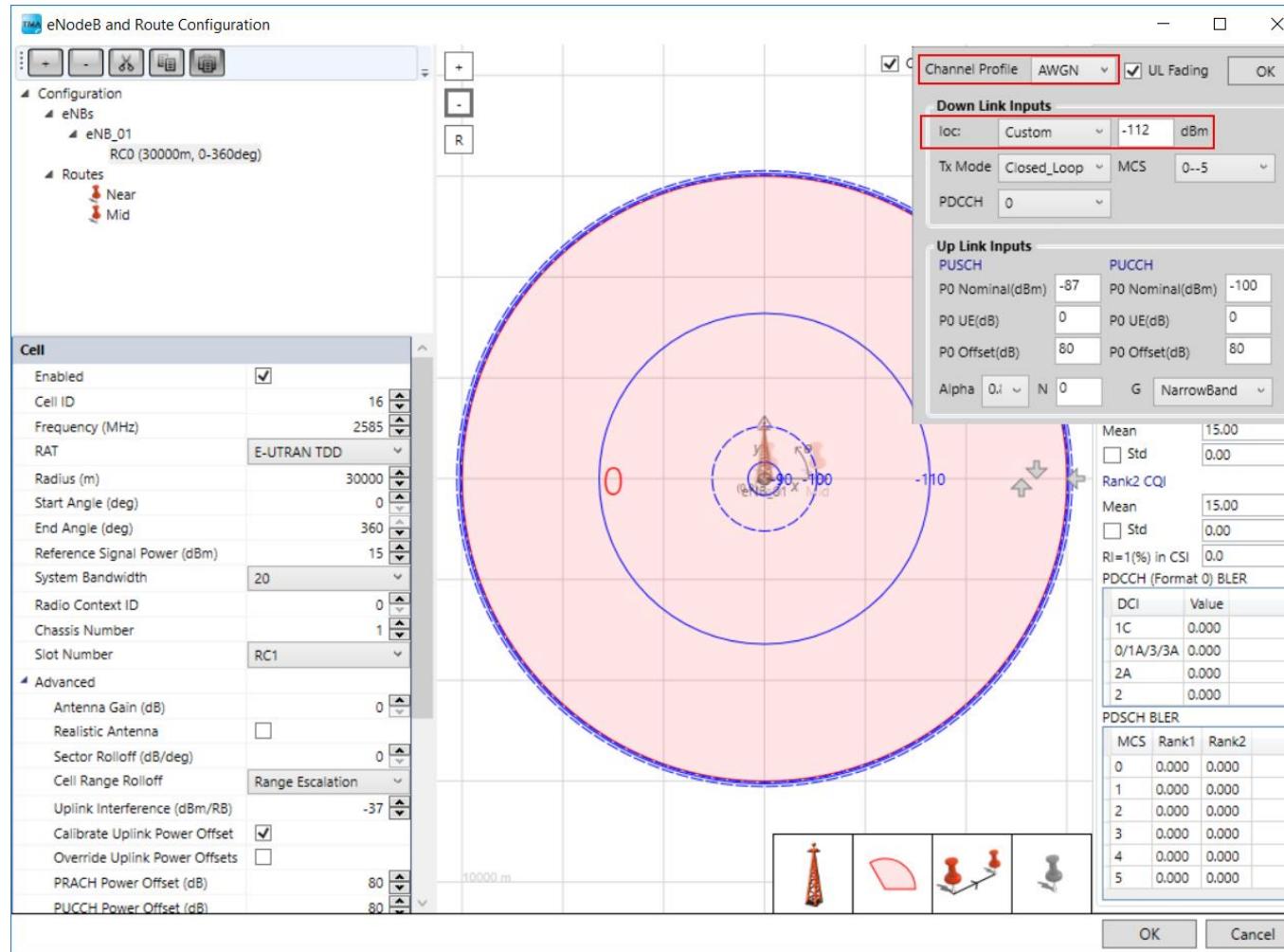
设置中点信道模型



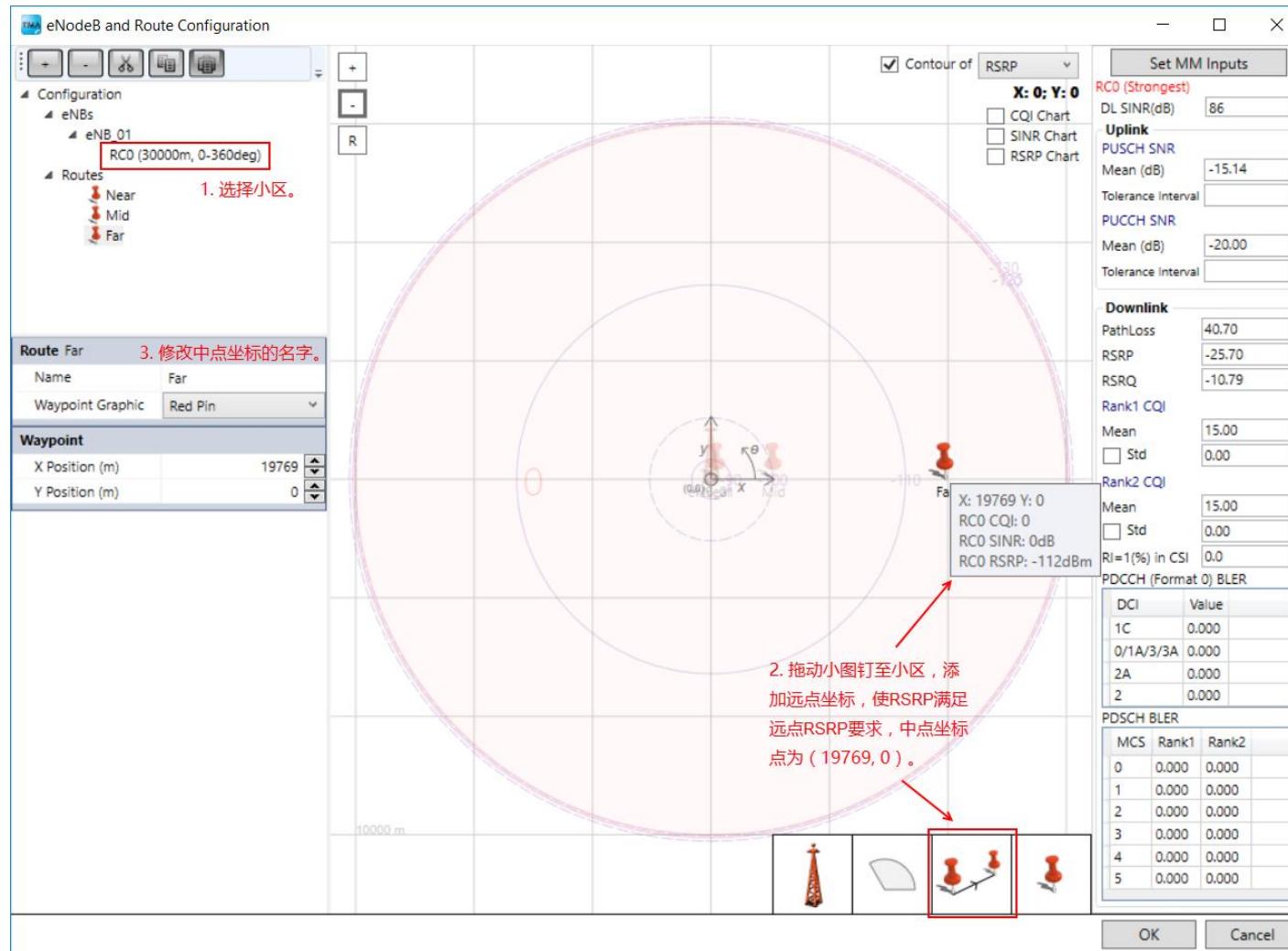
设置远点信道模型

Set MM Inputs

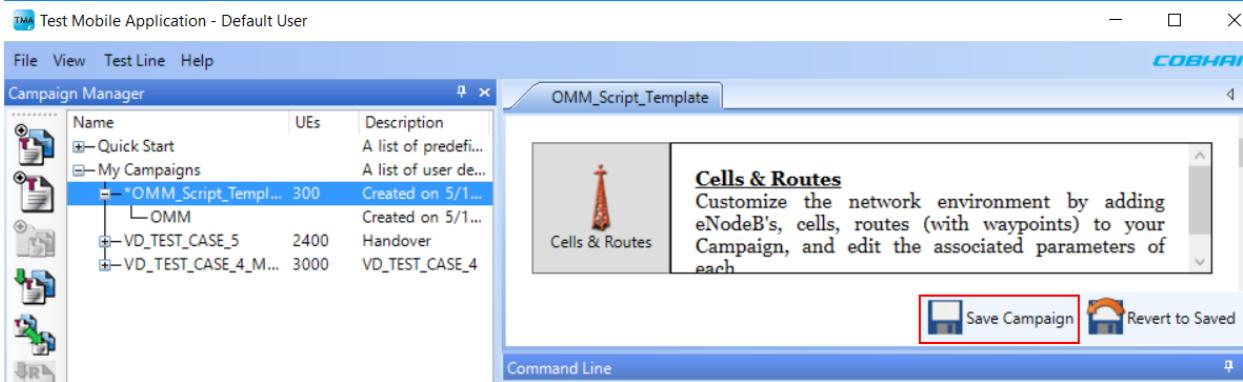
- 远点 $I_{loc} = RSRP - SINR = -112dBm - 0dB = -112dBm$



设置远点信道模型



- 远中近坐标点选取完成，点击**Save Campaign**及时保存相关配置。



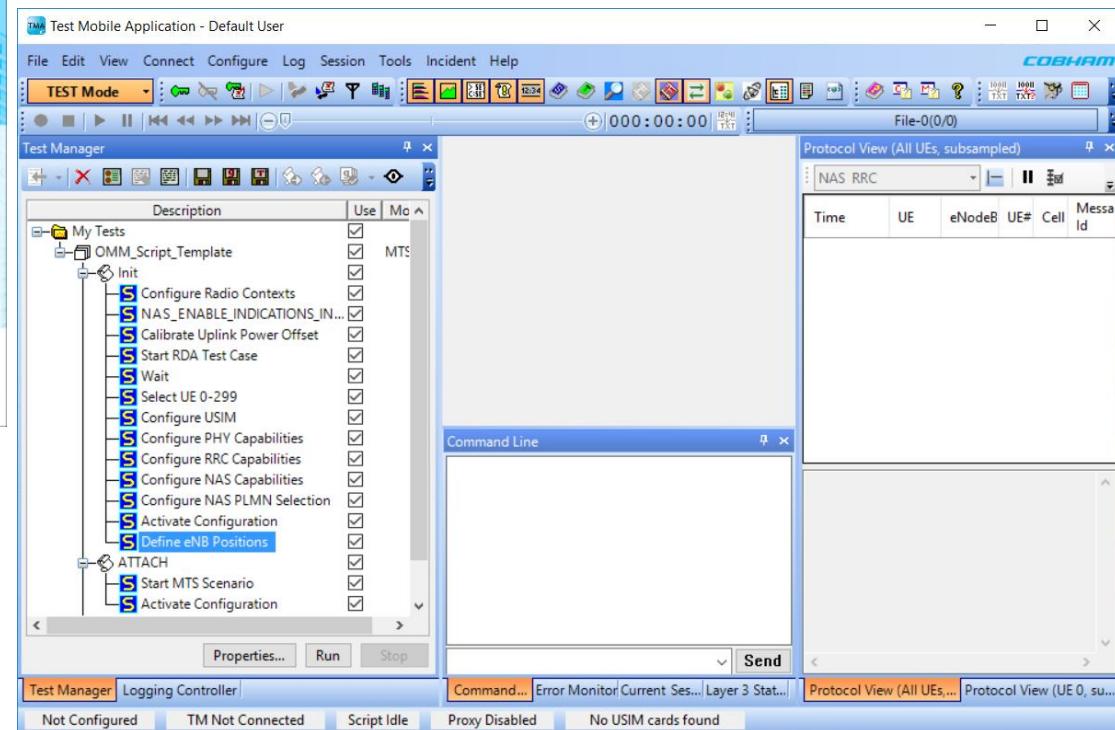
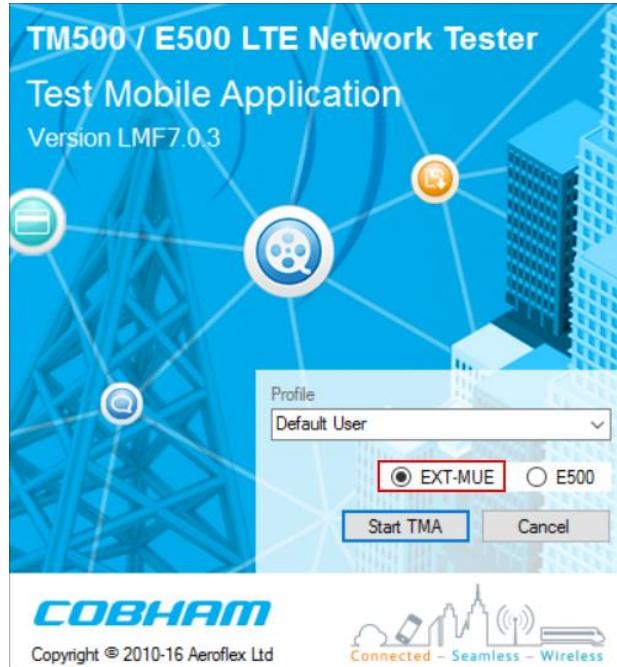
- OMM相关参数如下所示

eNB Position (X, Y)	DL Frequency (MHz)	Sector Start	Sector End	Cell Range (m)	Reference Signal Power (dBm)
(0, 0)	2585	0	360	30000	15

OMM	RSRP (dBm)	SINR (dB)	X (m)	Y (m)	Loc (dBm)
近点	-80	20	500	0	-100
中点	-100	10	5275	0	-110
远点	-112	0	19769	0	-112

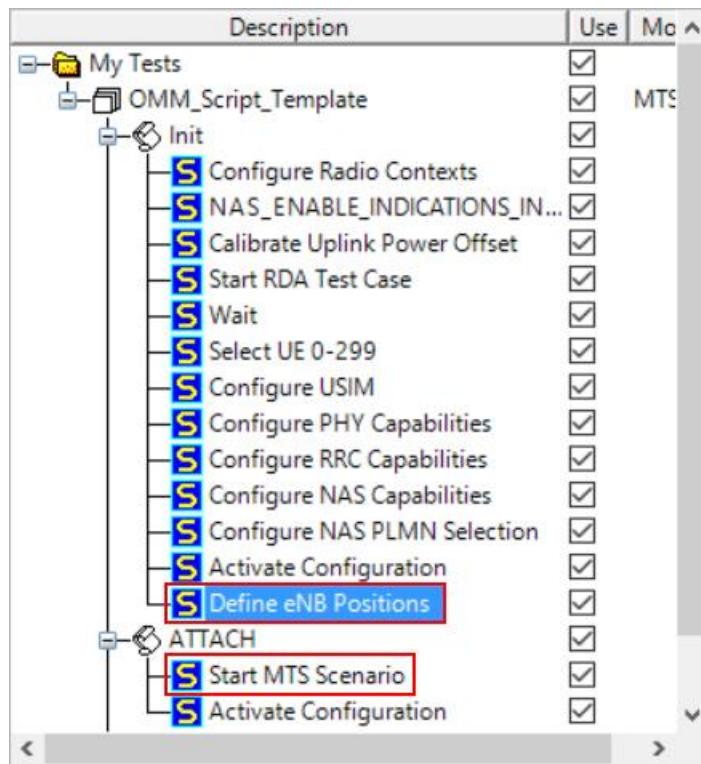
备注：理论上，只要是满足远中近点**RSRP**要求的任意坐标点都行，但为方便预览**RSRP/SINR/CQI**，建议选取的远中近坐标点分布在同一直线上，例如都在X轴或Y轴上。

- 关闭并重新打开TMA，选择EXT-MUE GUI.



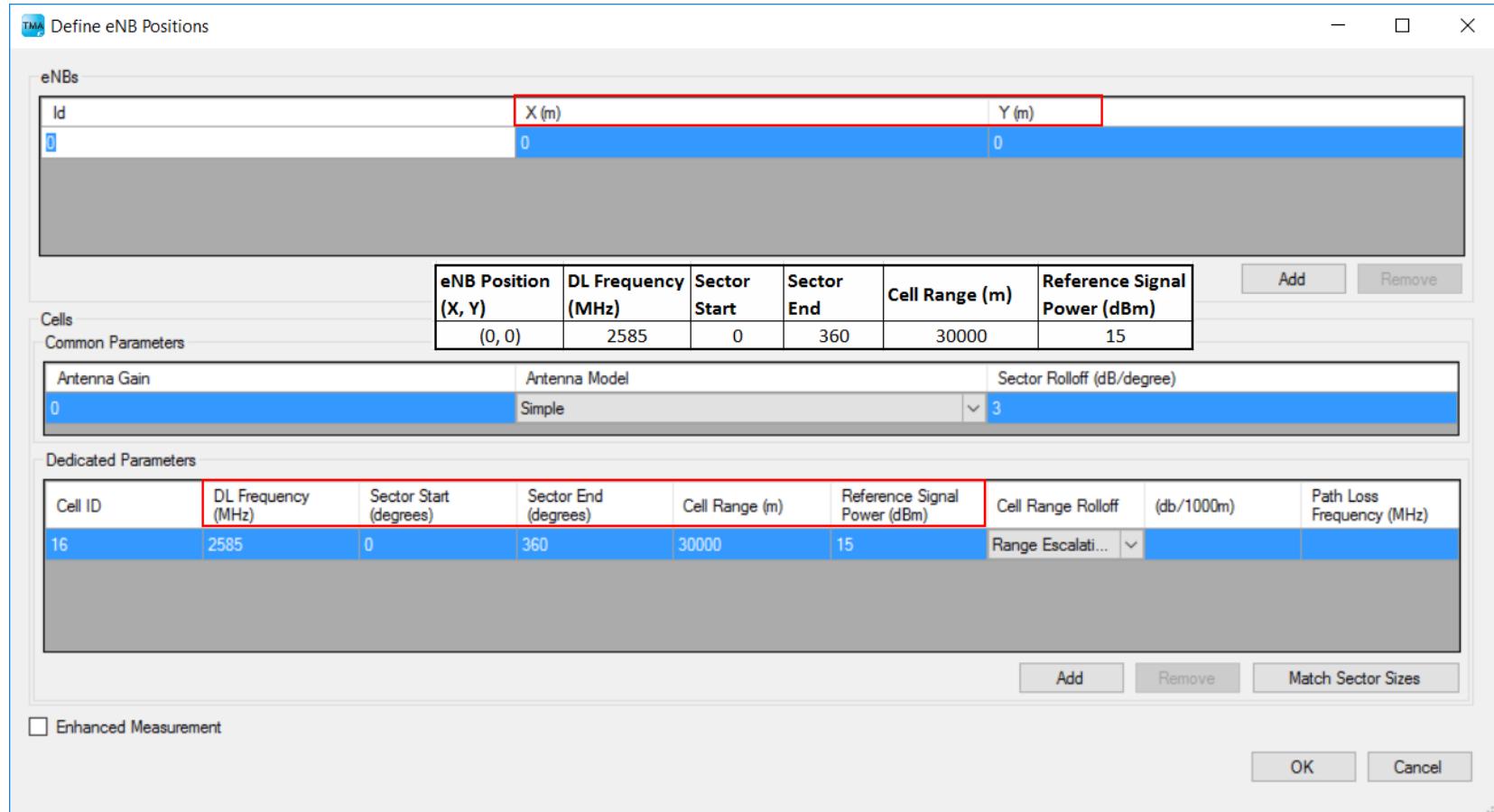
EMUE GUI Script

- 根据E500 GUI确定的的OMM参数配置，更新EXT-MUE脚本OMM相关设置，主要包括：
 - Define eNB Positions
 - Start MTS Scenario



Define eNB Positions

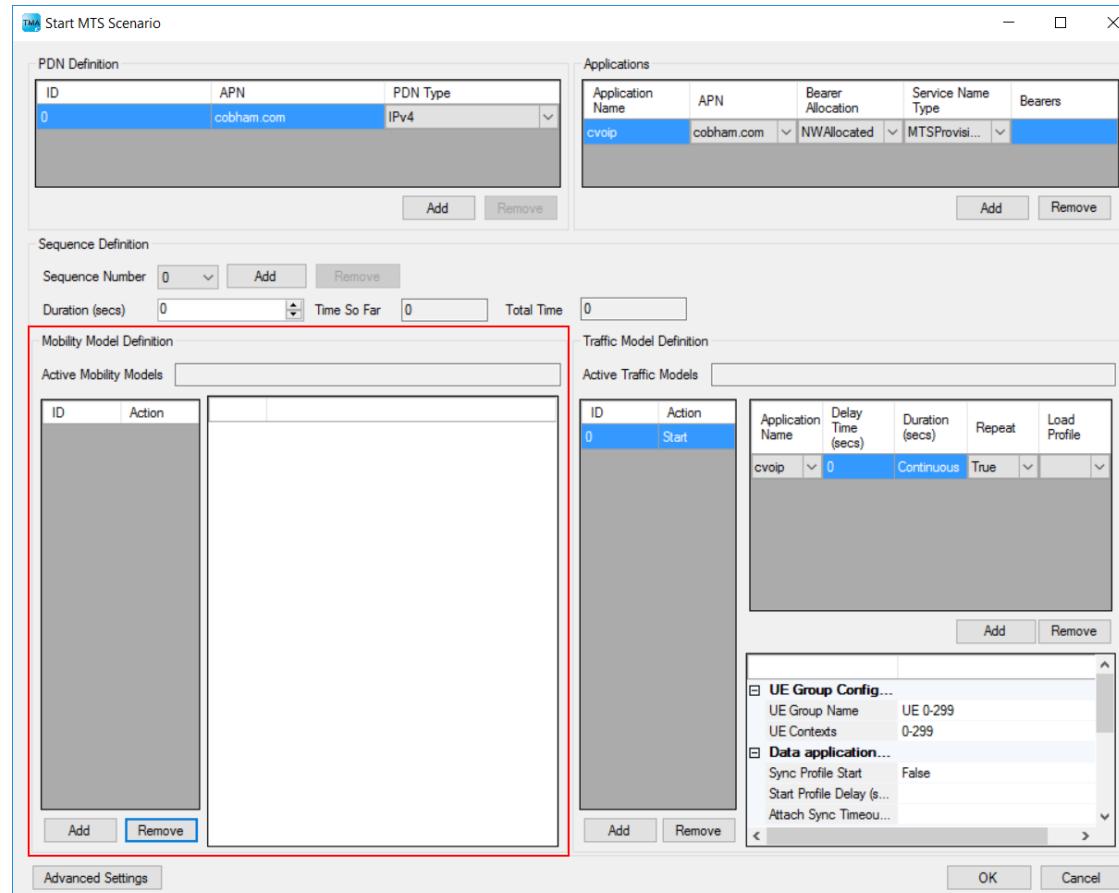
- 更新**Define eNB Positions**参数配置。



备注：如果测试*Small Cell*，请务必勾选左下角的**Enhanced Measurement**.

Start MTS Scenario

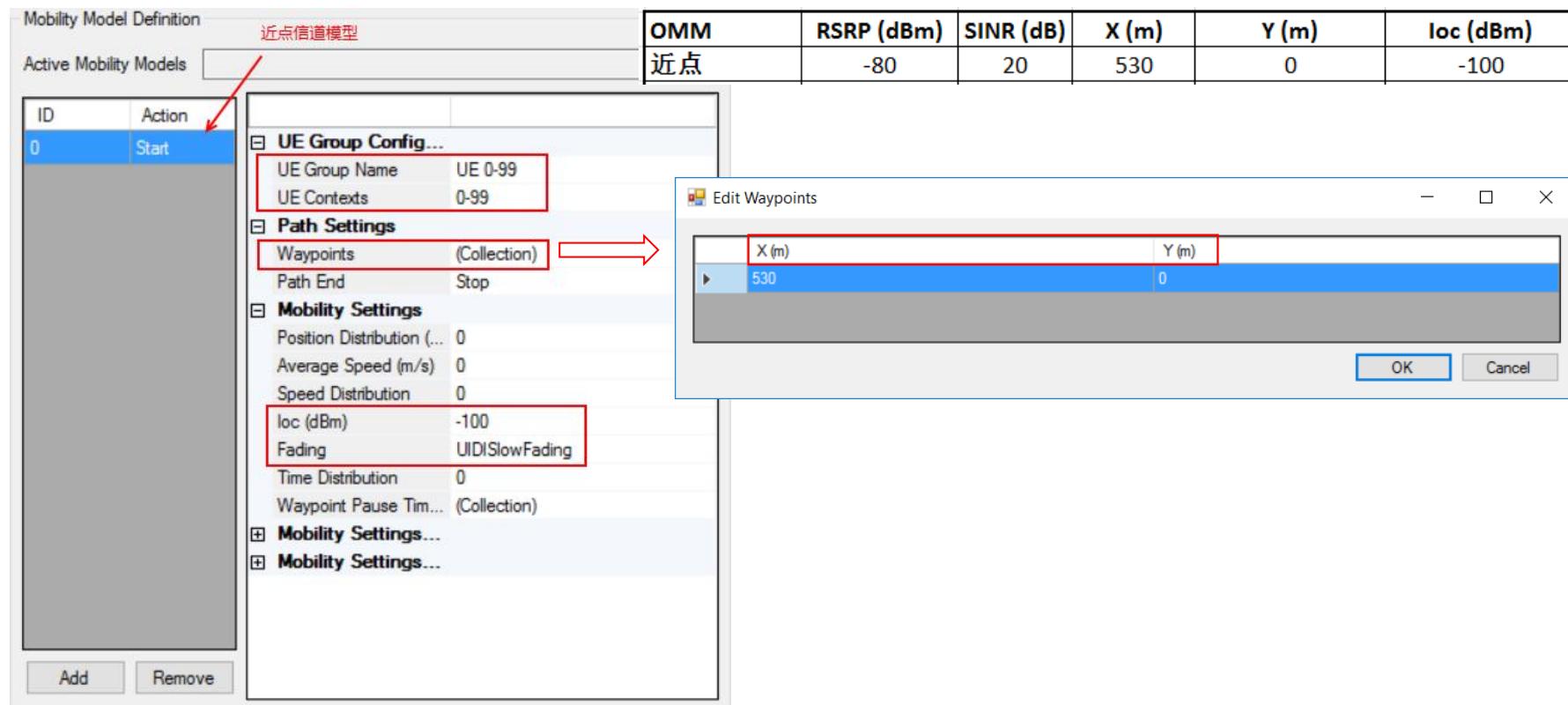
- 添加或更新**Mobility Model Definition.**



备注：如果UE没有配置信道模型，那么此UE默认采用的是真实环境的信道条件。

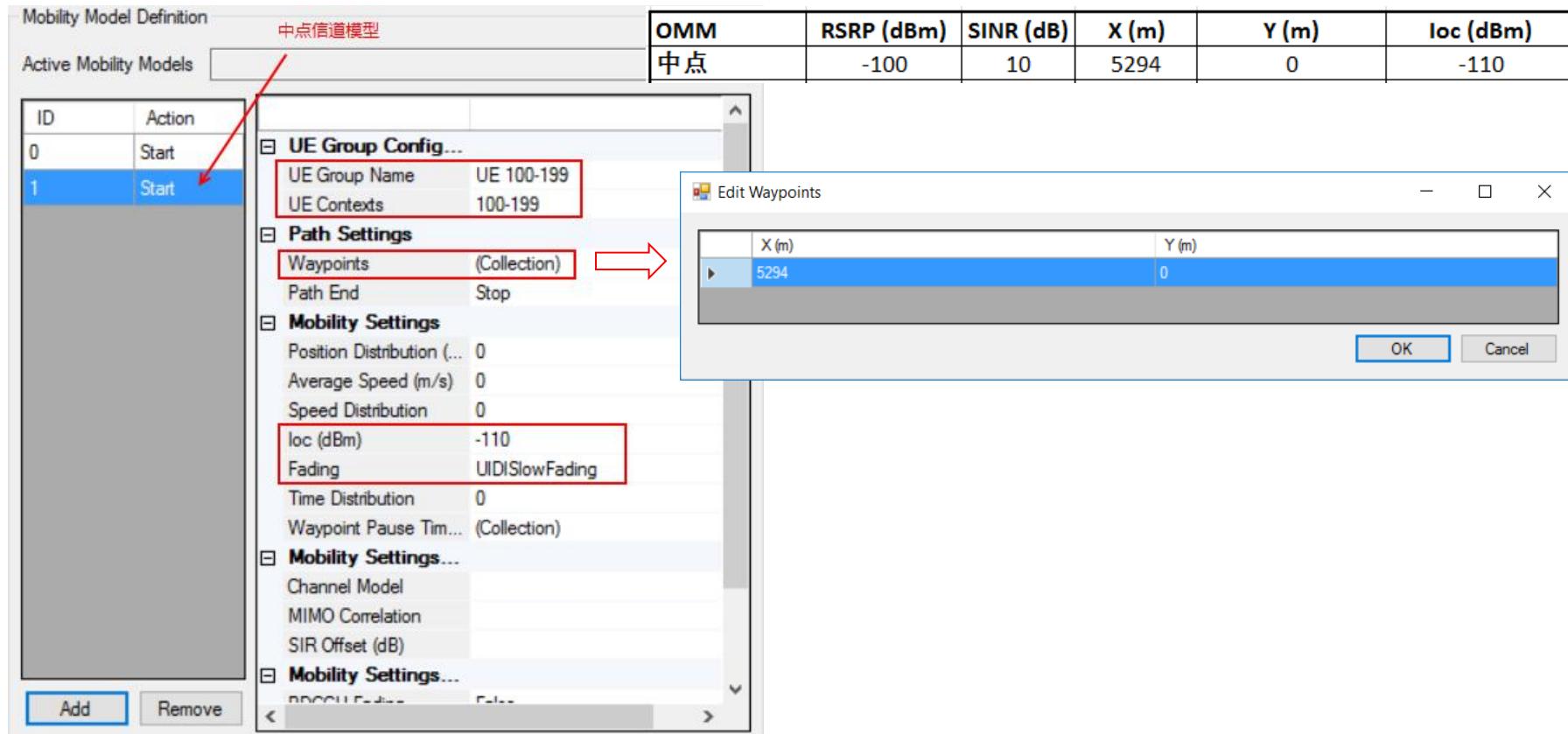
Start MTS Scenario

- 添加或更新近点信道模型
 - 定义信道模型运行于哪个UE Group (UE Contexts).
 - 设置Waypoints/Ioc/Fading.



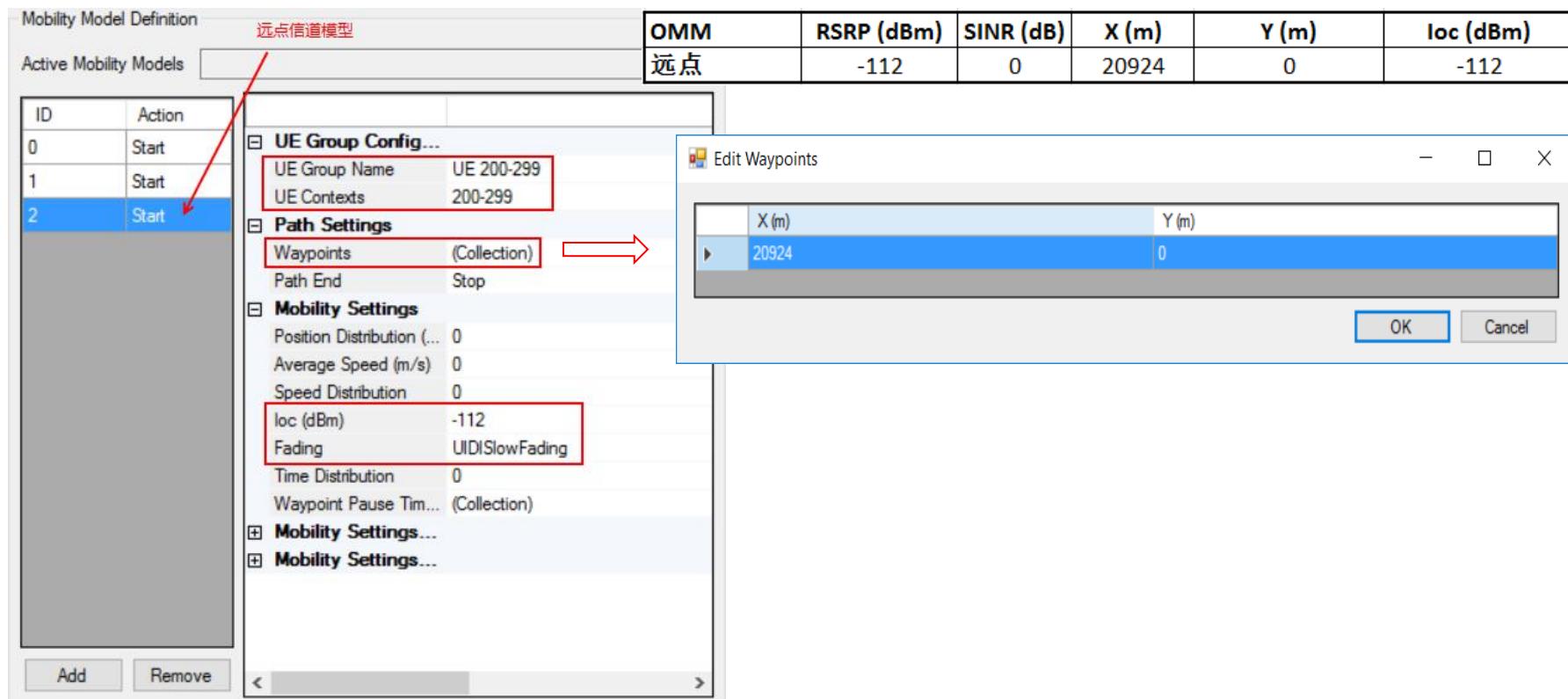
Start MTS Scenario

- 添加或更新中点信道模型
 - 定义信道模型运行于哪个UE Group (UE Contexts).
 - 设置Waypoints/Ioc/Fading.



Start MTS Scenario

- 添加或更新远点信道模型
 - 定义信道模型运行于哪个UE Group (UE Contexts).
 - 设置Waypoints/Ioc/Fading.

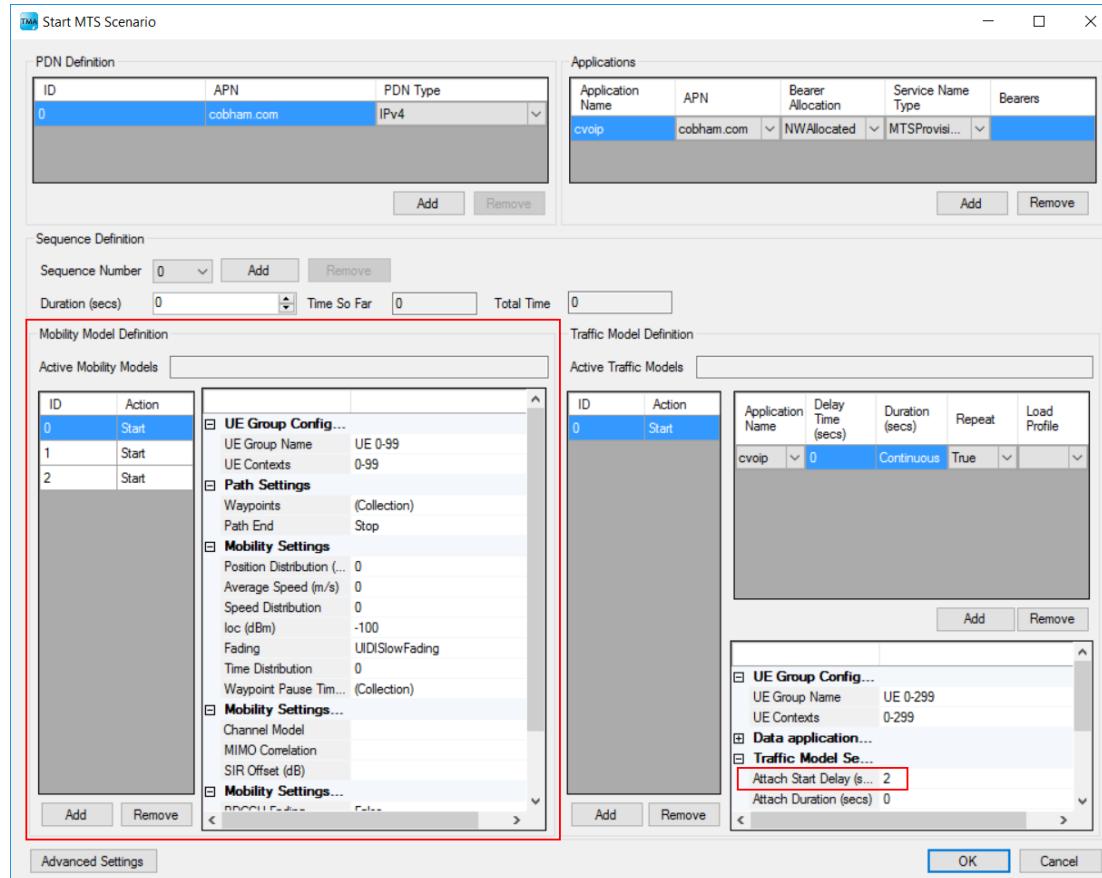


OMM Script Template

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Start MTS Scenario

- 通过以上步骤，EXT-MUE脚本的OMM相关设置完成。



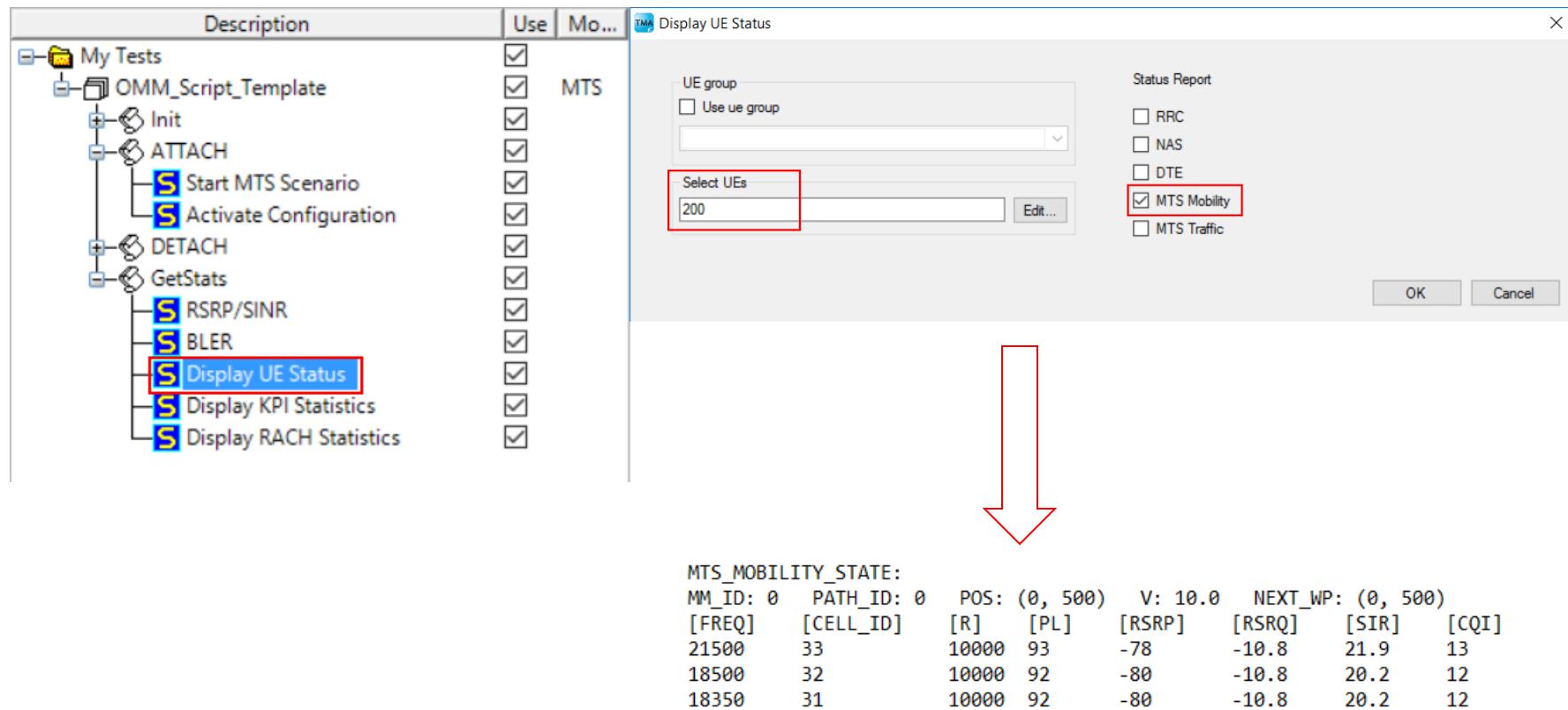
备注：为了预留一定时间使OMM生效，**Attach Start Delay**至少需设置2秒。

查询UE OMM状态

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Display UE Status

- 测试过程中，可通过**Display UE Status**查询任意指定UE的移动状态信息。

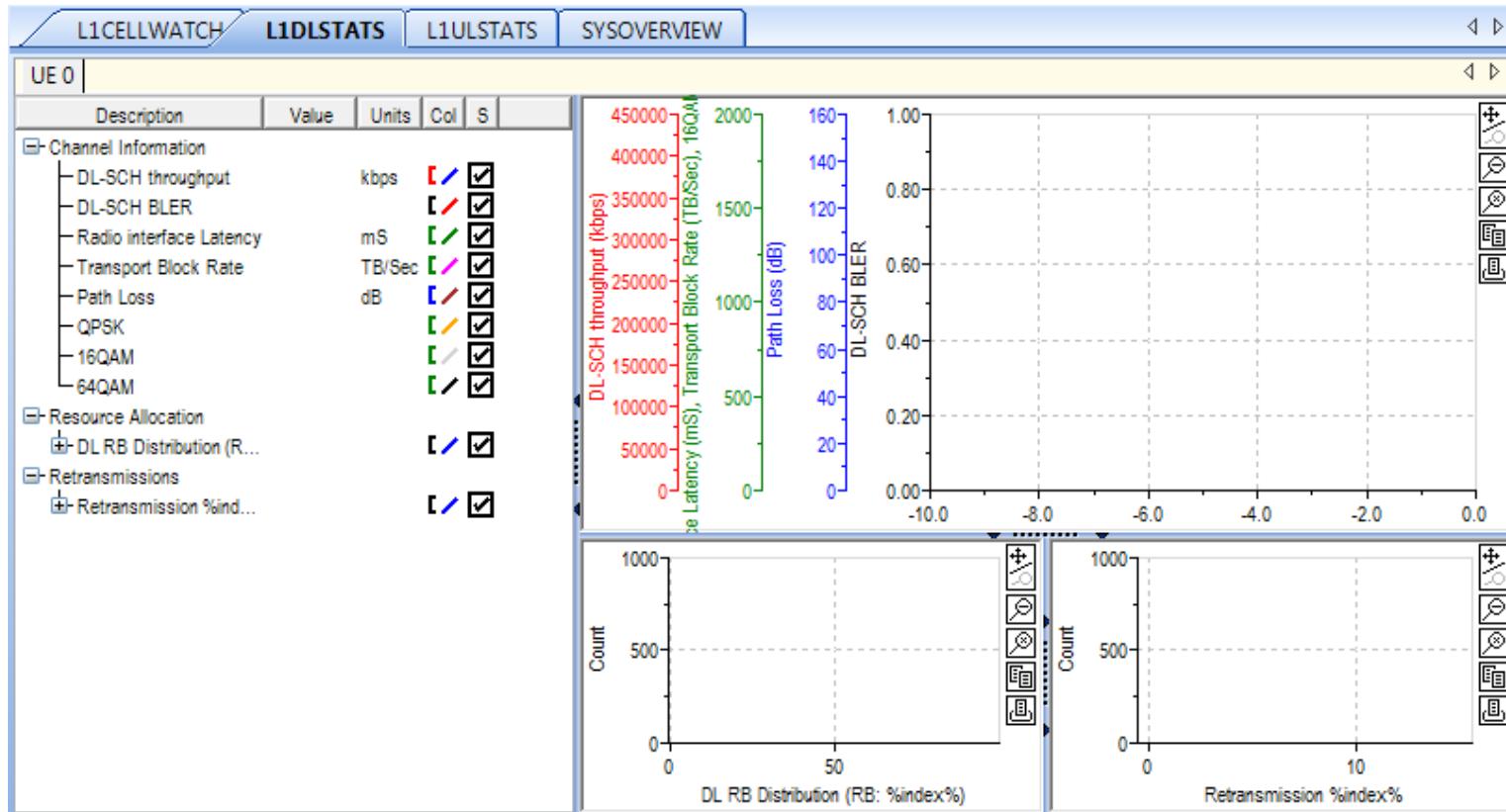


实时查看Path Loss

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L1DLSTATS

- 测试过程中，可通过**L1DLSTATS View**界面实时查看**Path Loss**.
SINR则需要通过**L1DLSTATS log**查看.

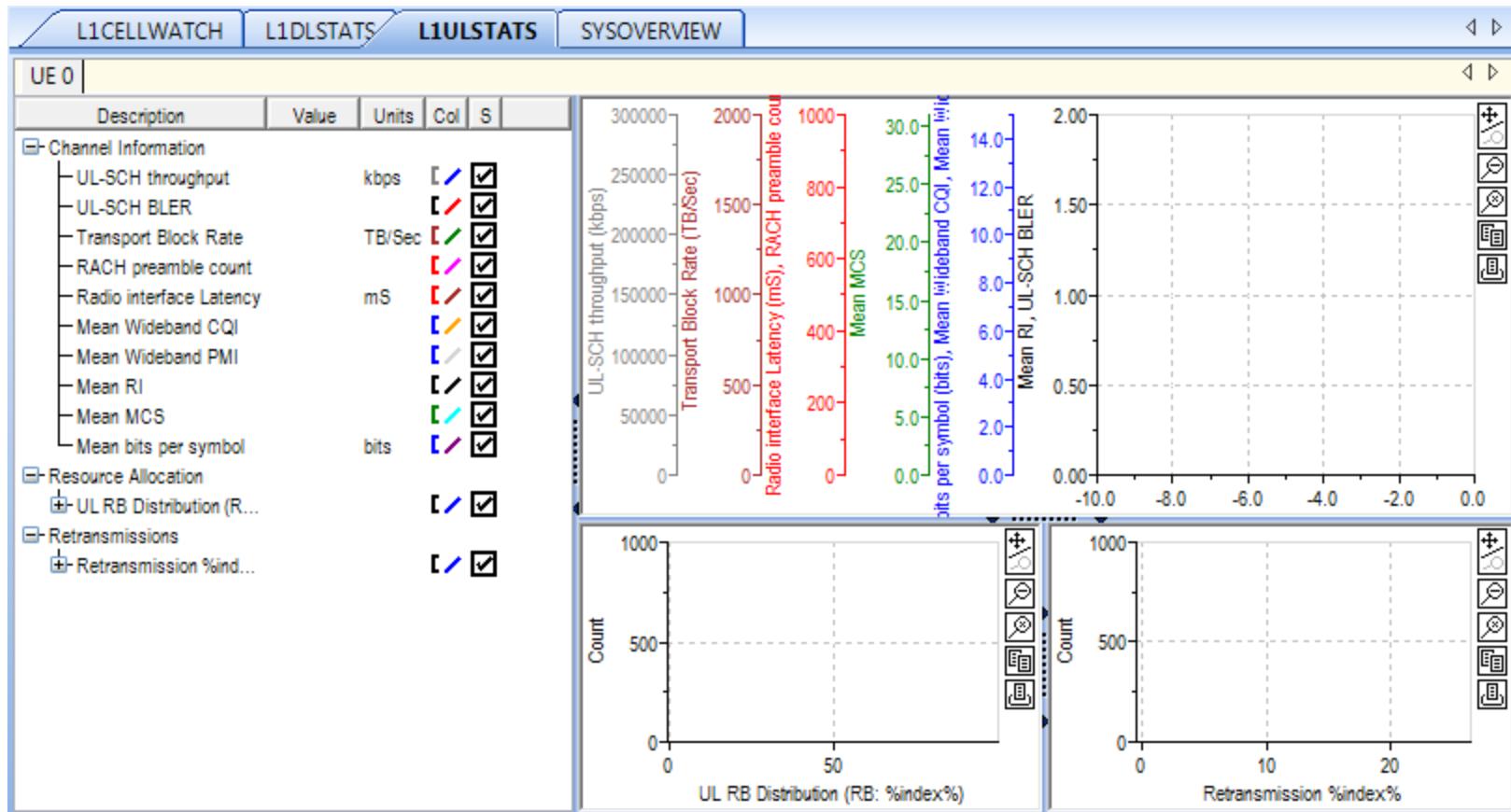


备注：如果UE没有配置信道模型，那么该UE的Path Loss默认为10. L1DLSTATS的SINR则记录为0。

实时查看CQI/PMI/RI

L1ULSTATS

- 测试过程中，通过**L1ULSTATS View**界面实时查看**Mean Wideband CQI**.



Handover信道模型



测试需求 & OMM参数配置

- UE在两个小区之前来回切换。
- 预知条件
 - 小区下行频率
 - 参考信号发射功率
 - 切换门限
- 通过E500 GUI， 获取如下OMM关键参数配置：

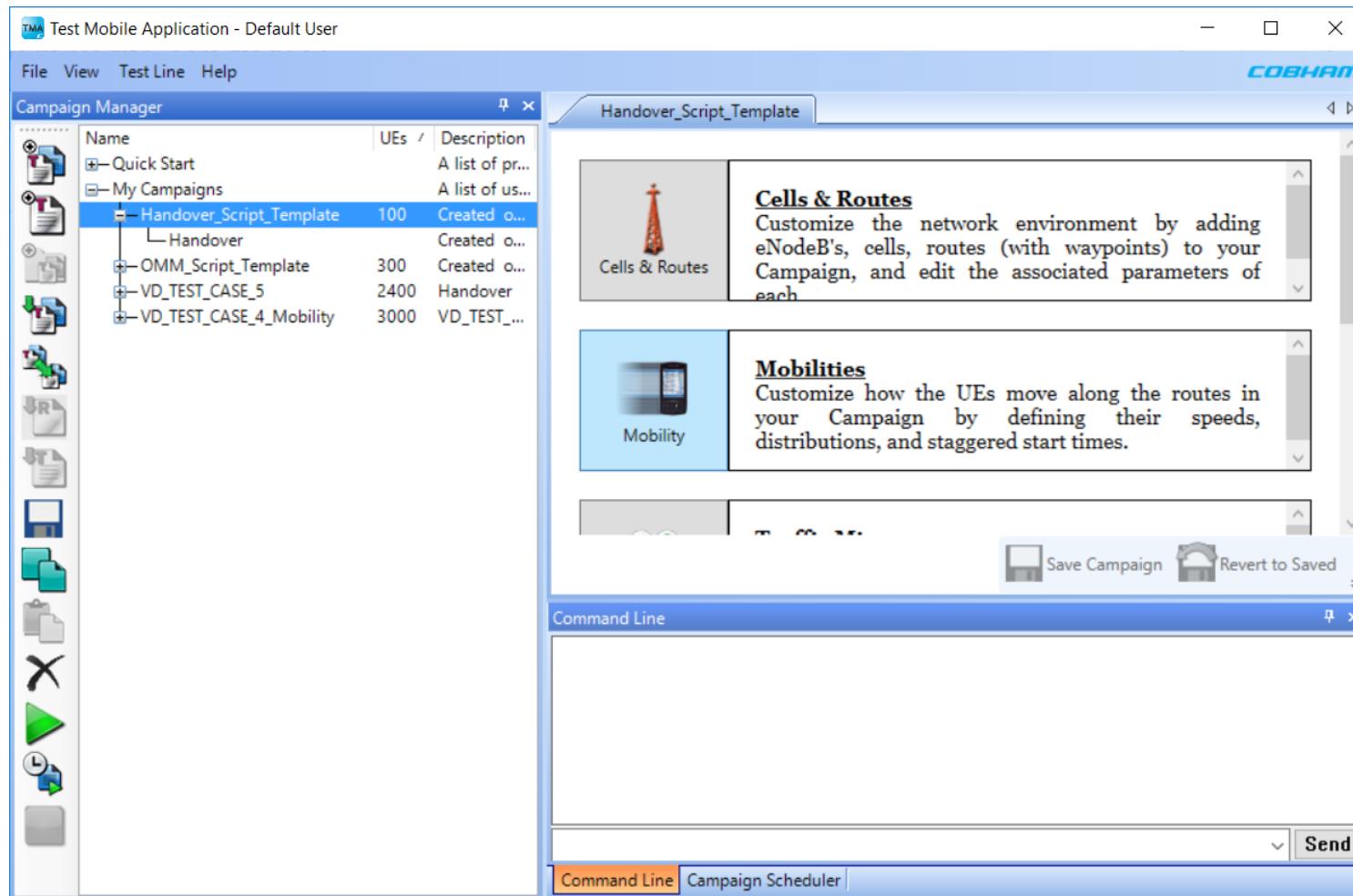
eNB Id	eNB Position (X, Y)	DL Frequency (MHz)	Sector Start	Sector End	Cell Range (m)	Reference Signal Power (dBm)
0						
1						

Route	Waypoint 1		Waypoint 2		Loc (dBm)
	X (m)	Y (m)	X (m)	Y (m)	

备注：EXT-MUE GUI的**Cell Range**等价于E500 GUI的**Radius**.

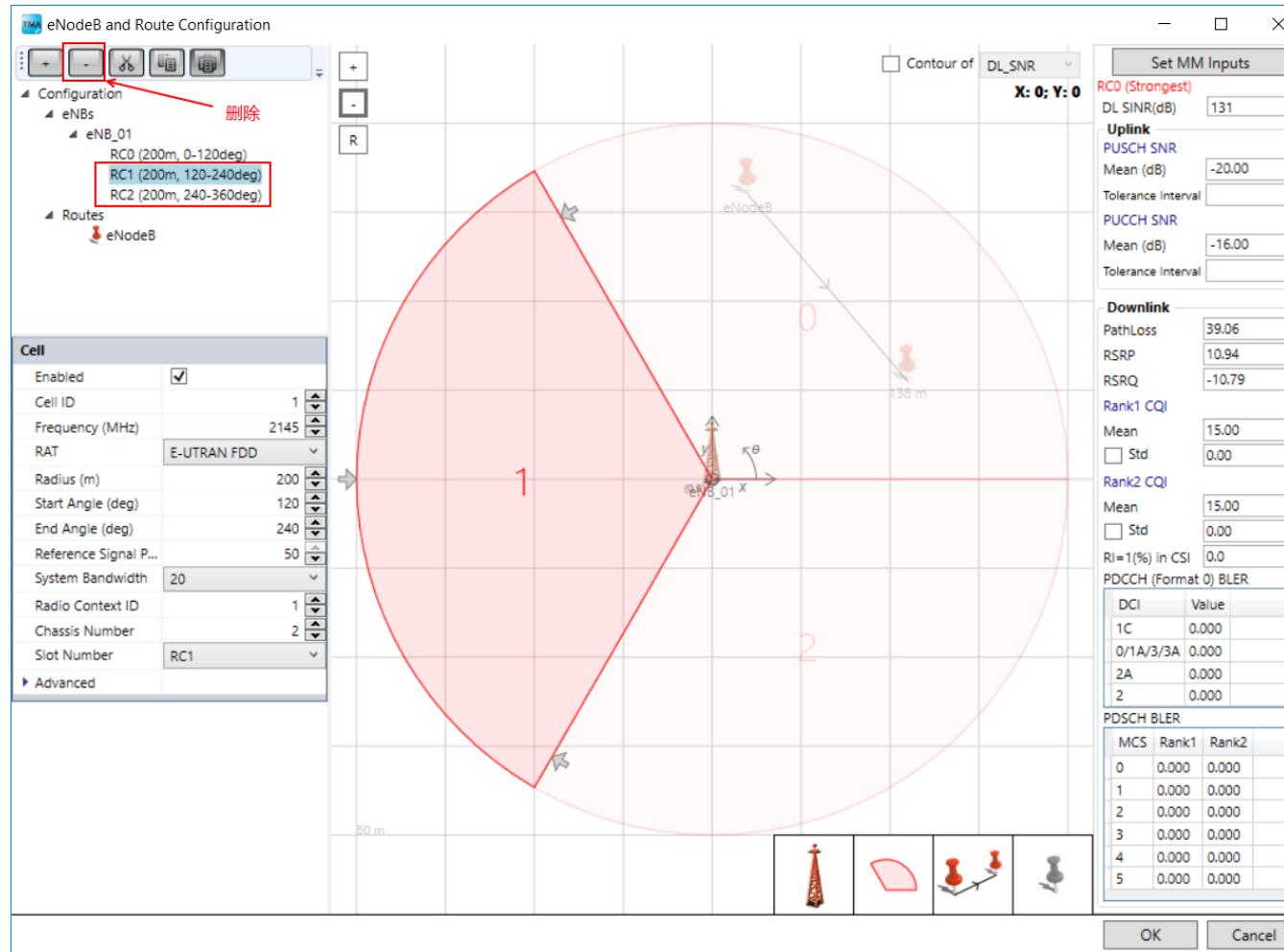
New Campaign

- 创建新的Campaign并相应更新Campaign名字。



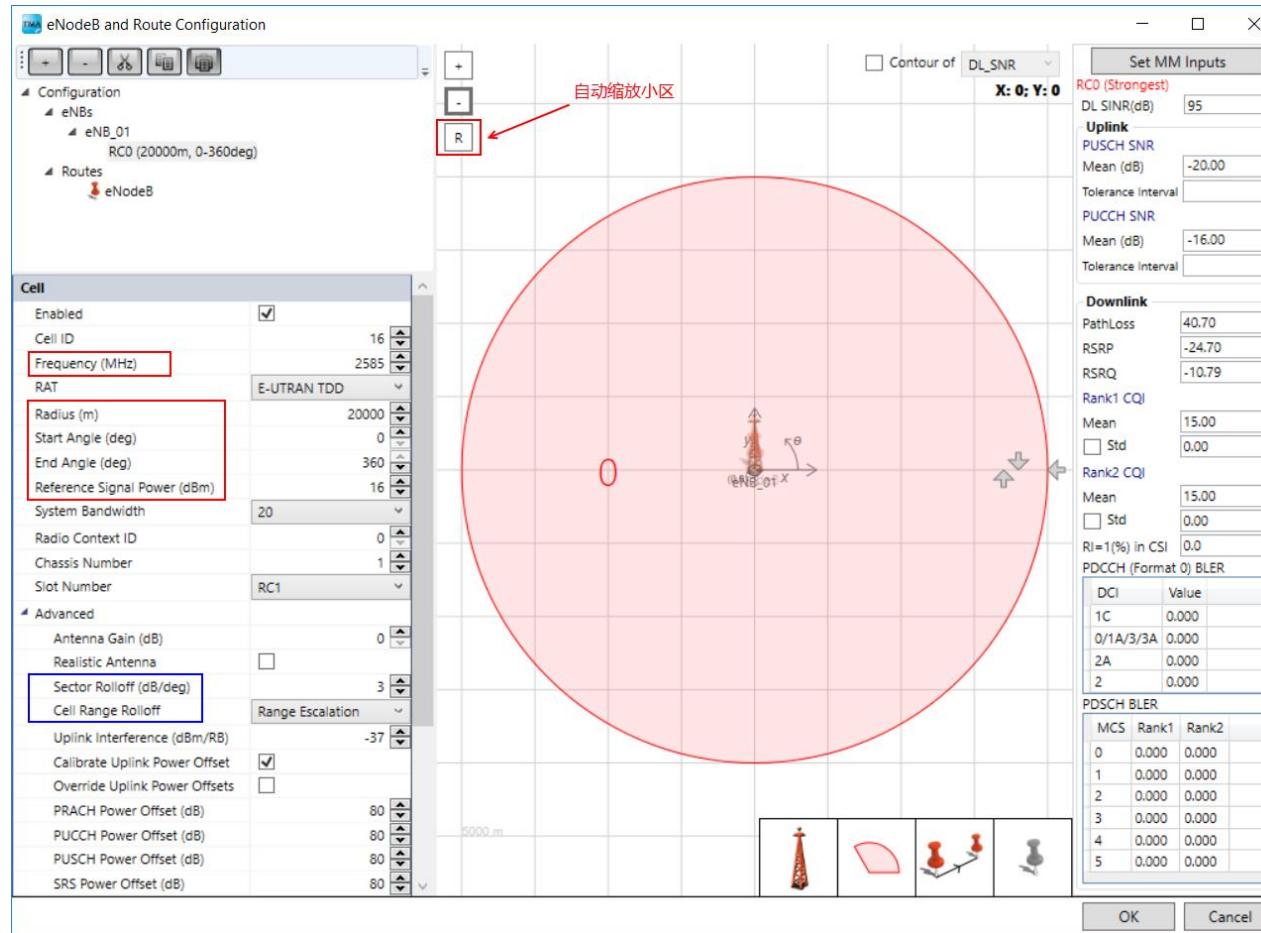
Cells & Route

- 删除eNB_01 RC1和RC2对应的小区。



配置小区参数

- 更新RC0 OMM相关参数： Frequency/Radius/Start & End Angle/RS Power.

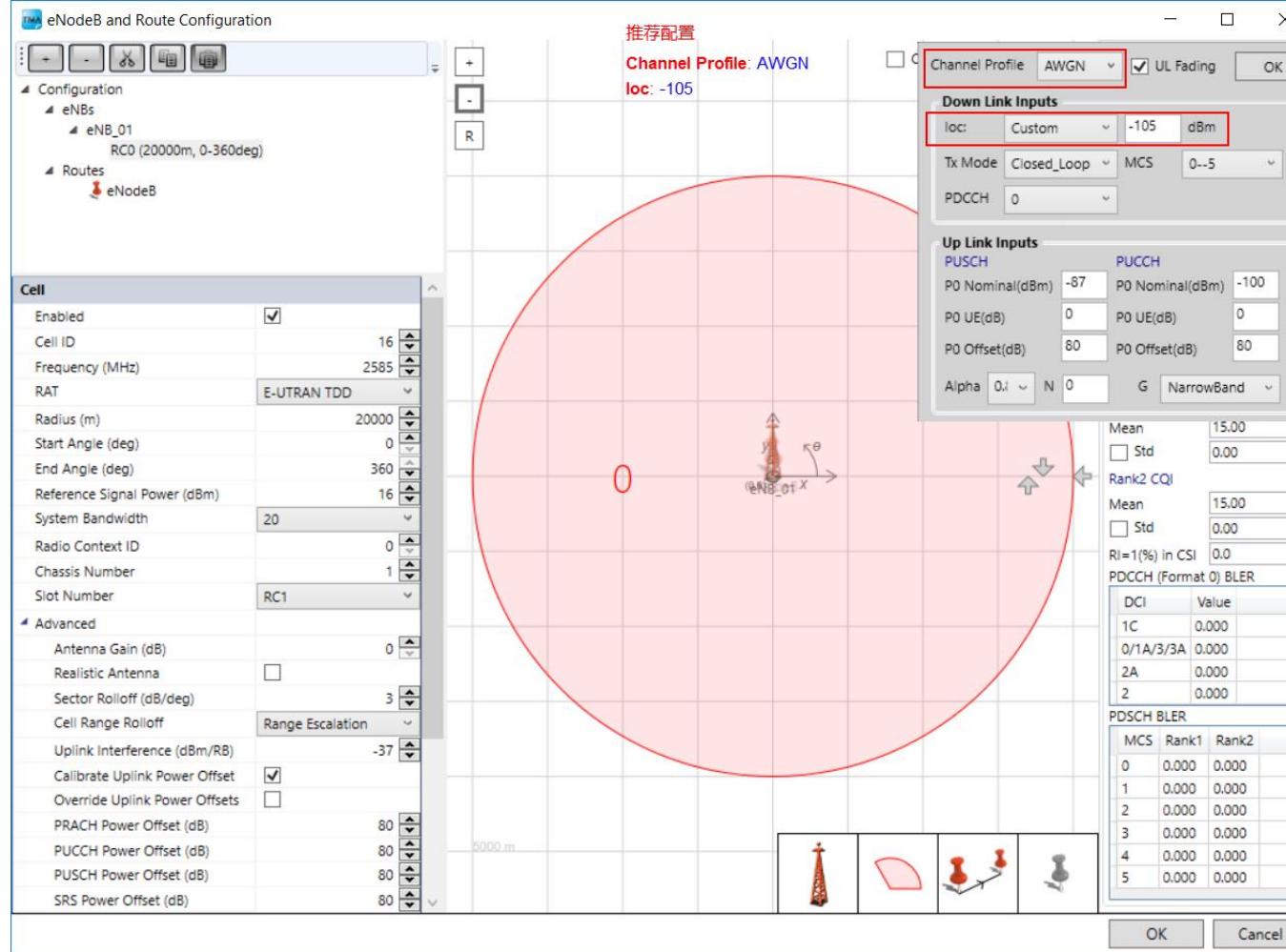


eNodeB and Route Configuration

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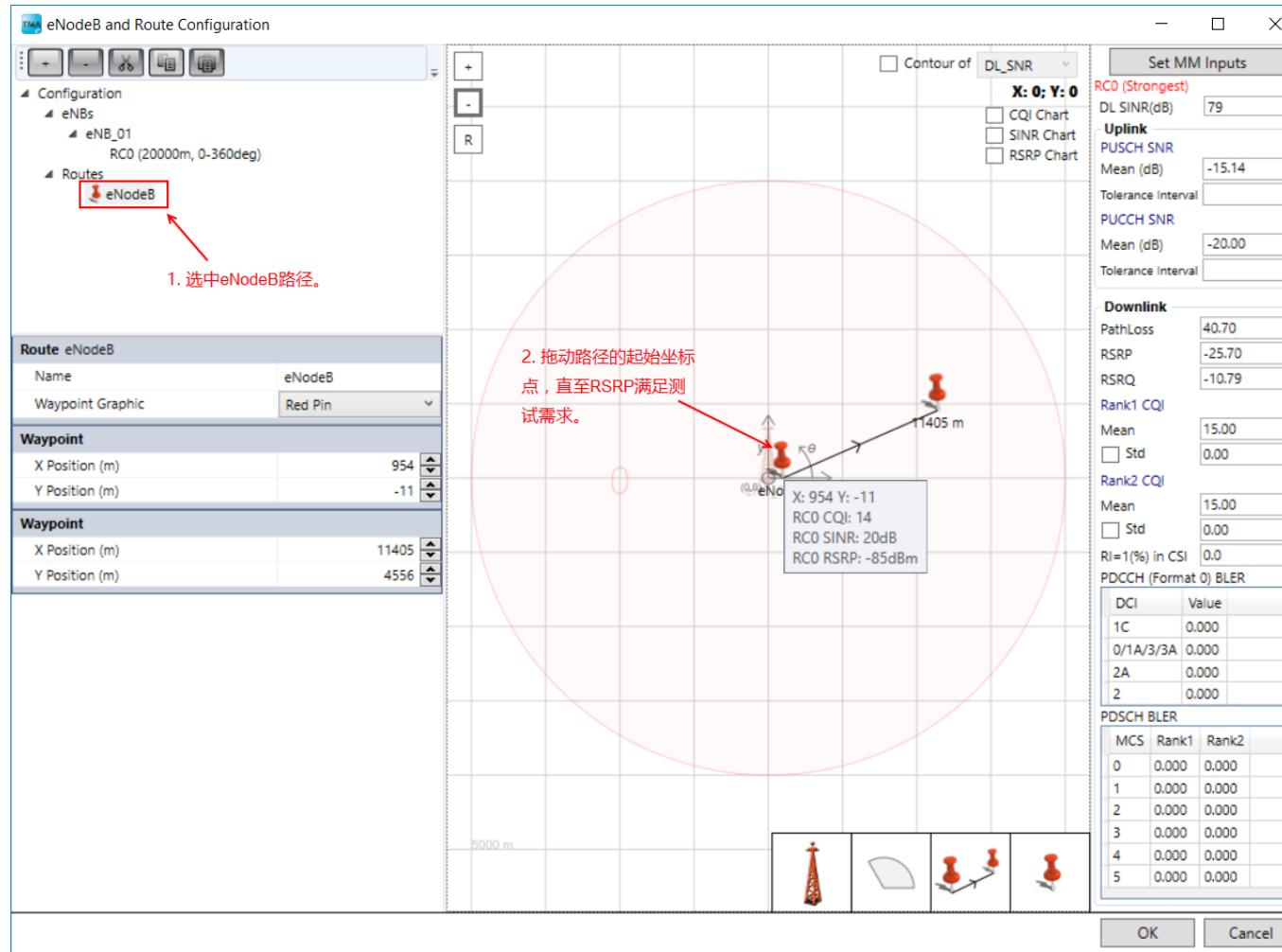
Set MM Inputs

- 更新**Set MM Inputs**参数: Channel Profile/Ioc



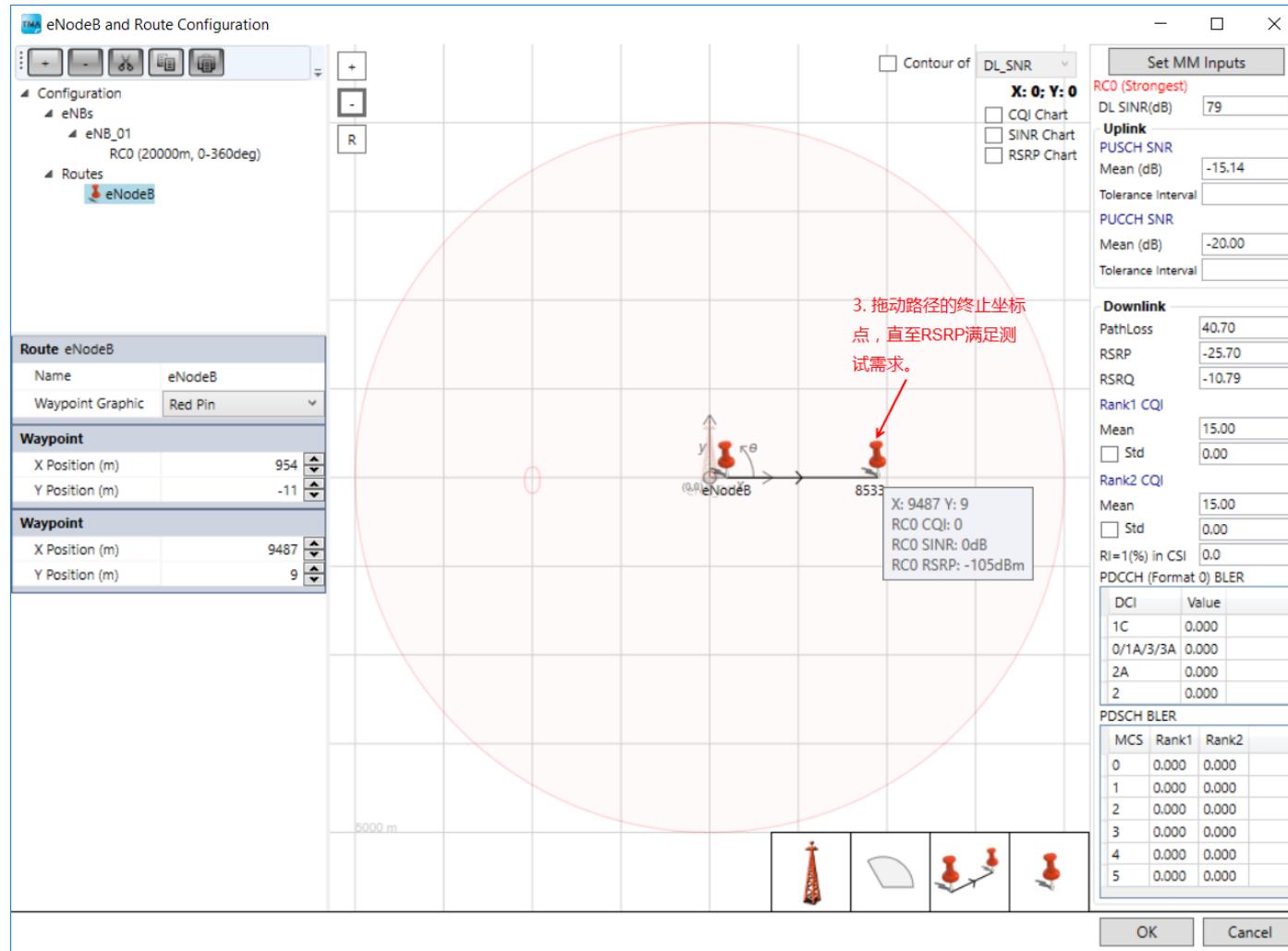
选择起始坐标点

- 拖动小图钉，实时显示当前位置的RSRP/SINR/CQI.

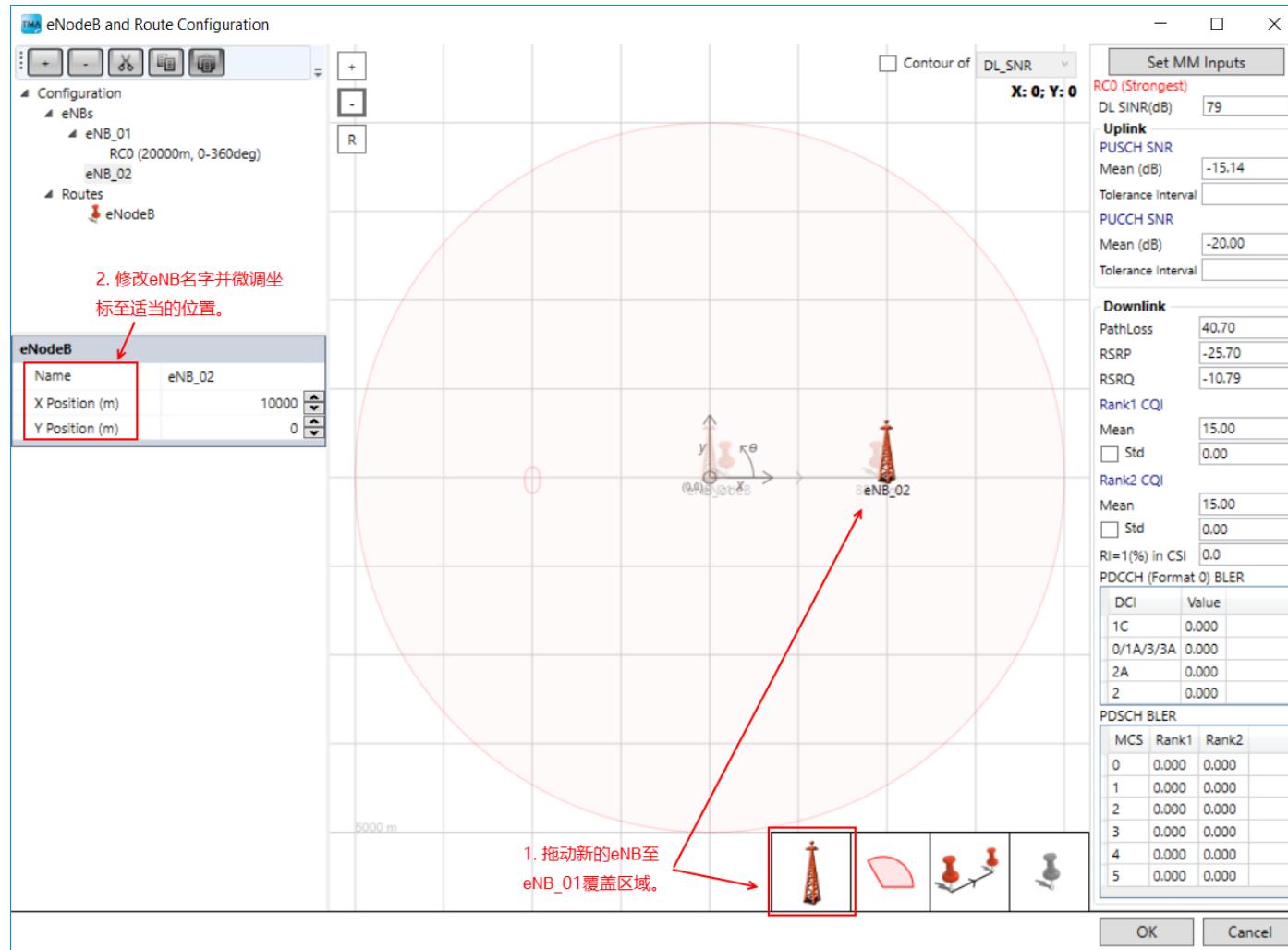


选择终止坐标点

COBHAM

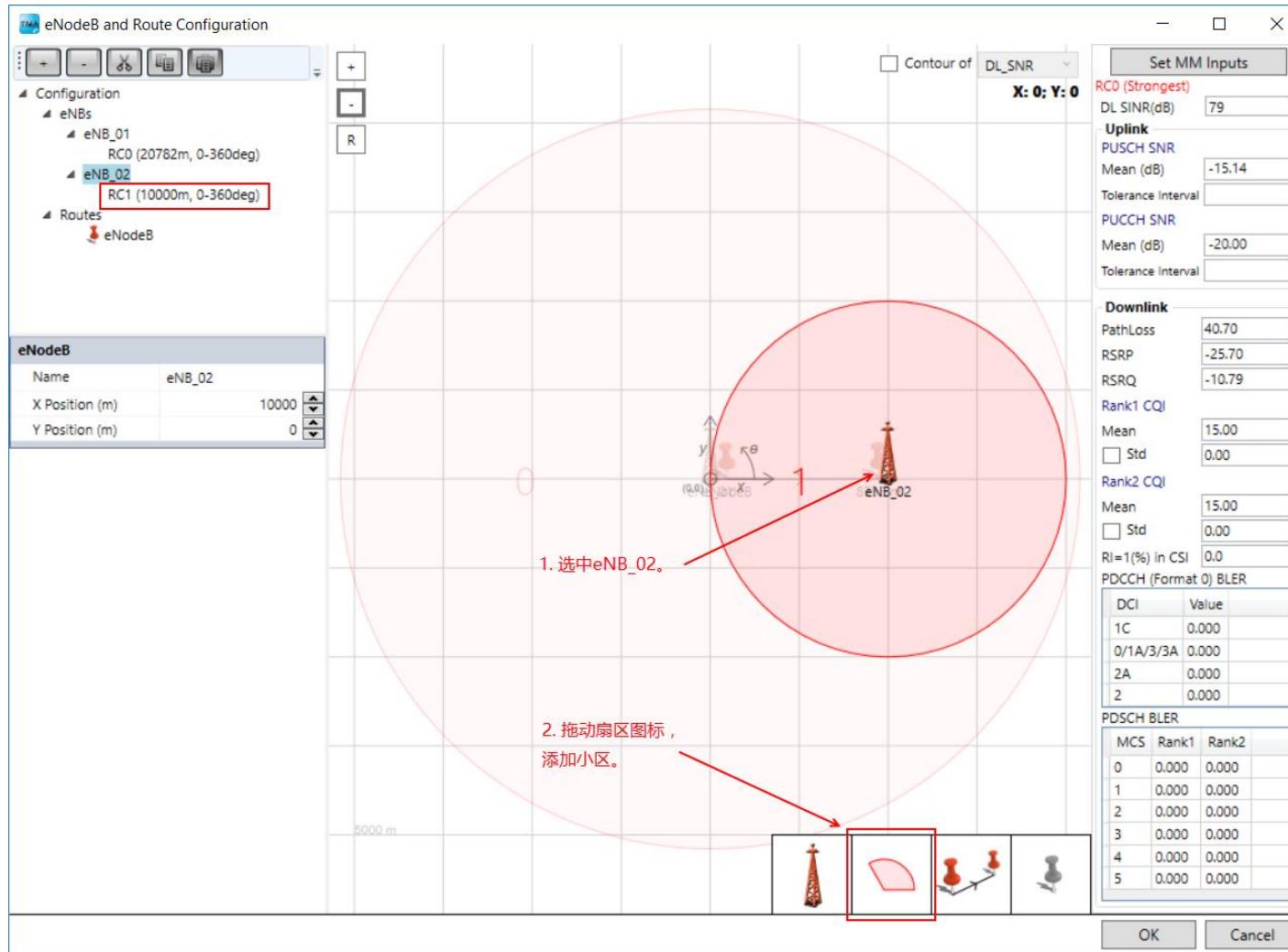


添加eNB_02

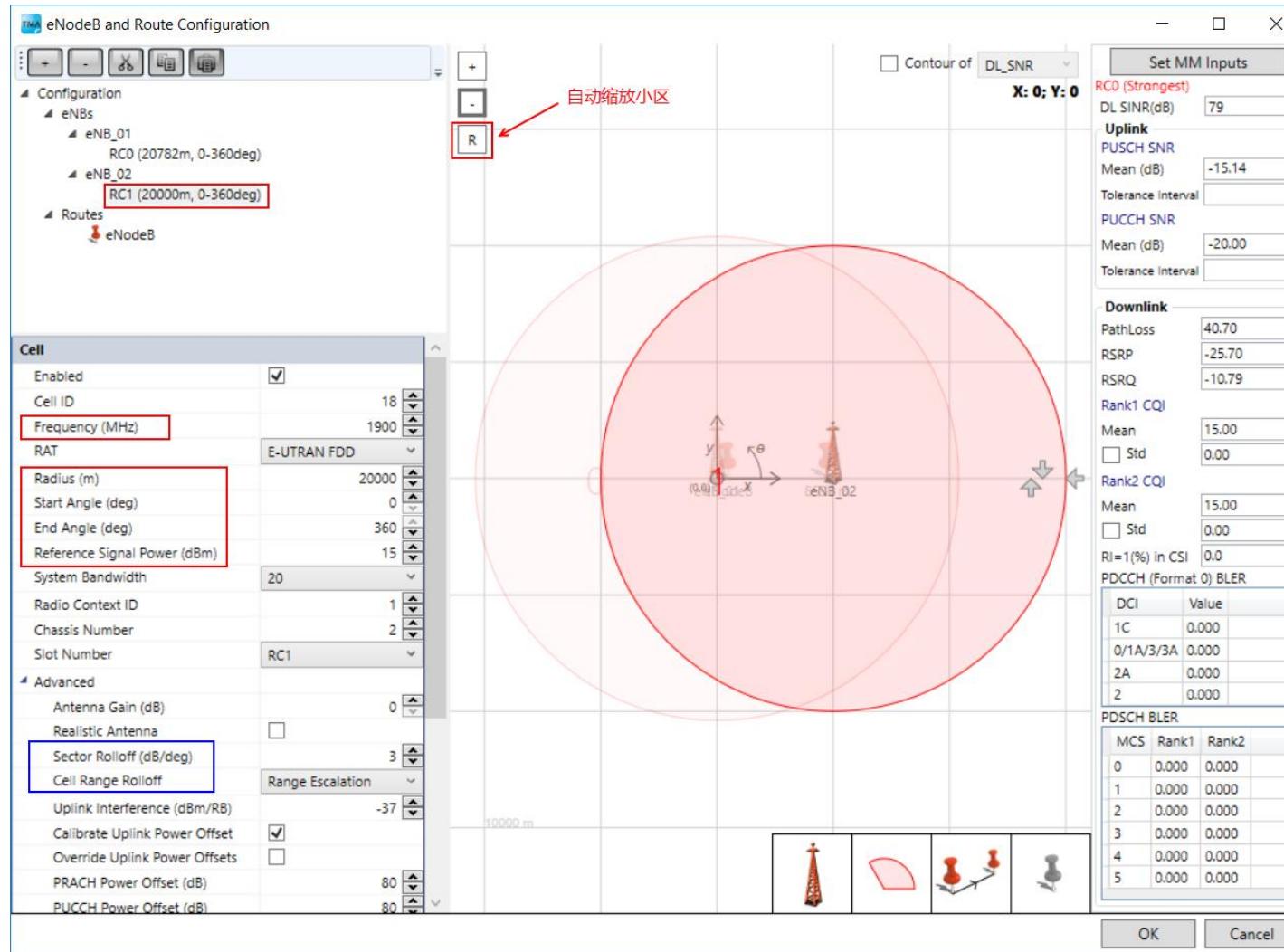


添加小区RC1

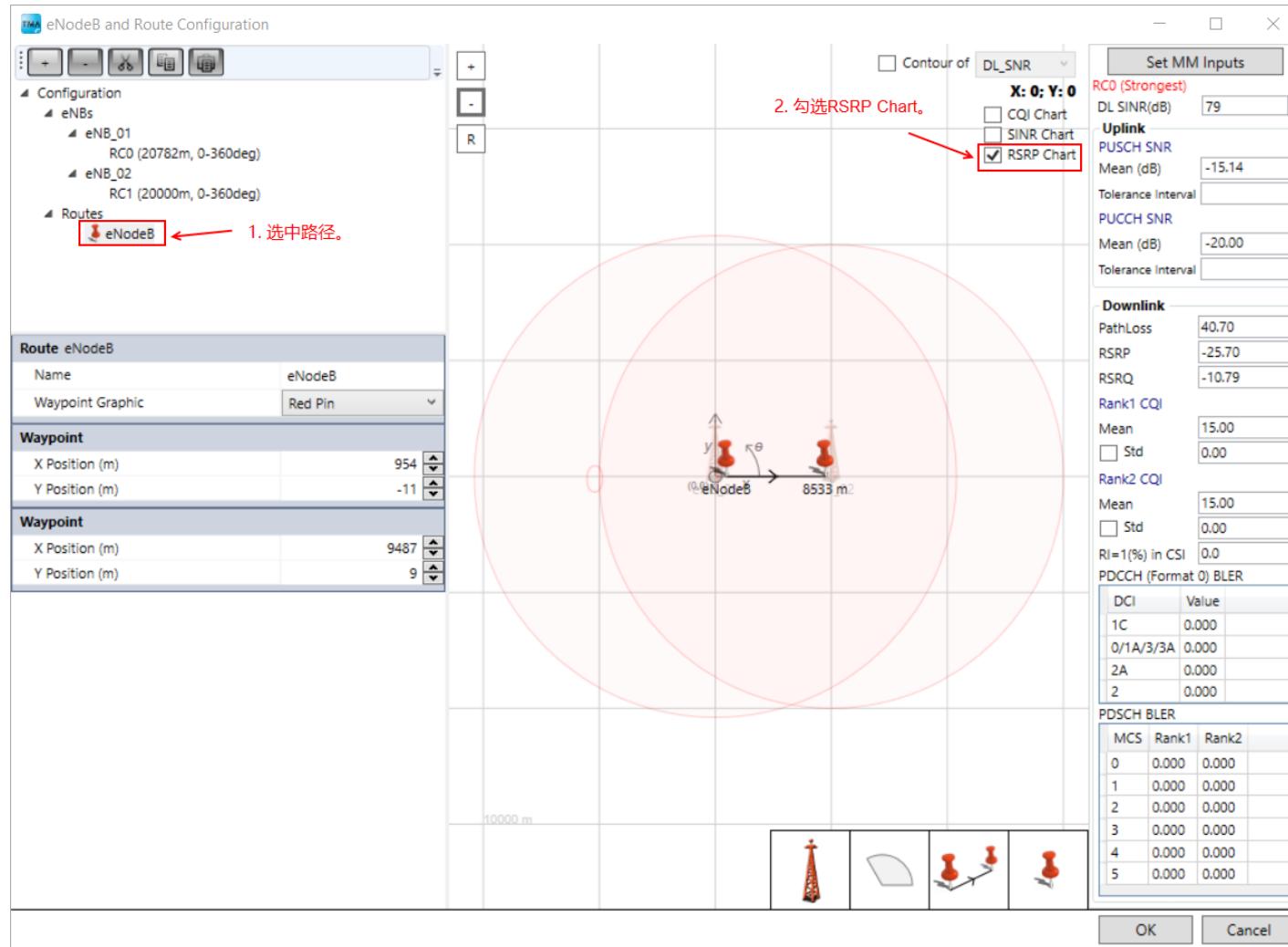
COBHAM



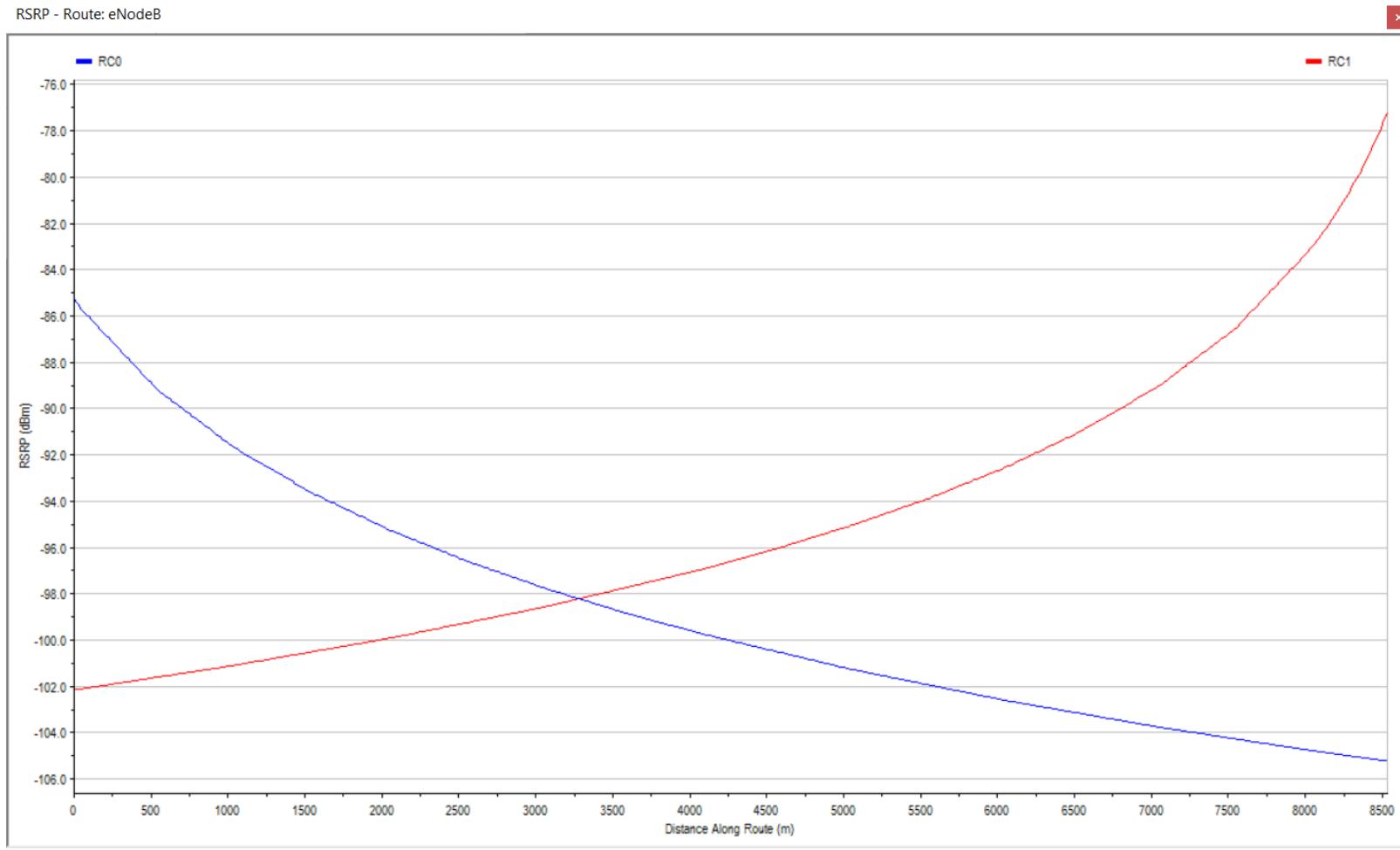
调整RC1小区参数



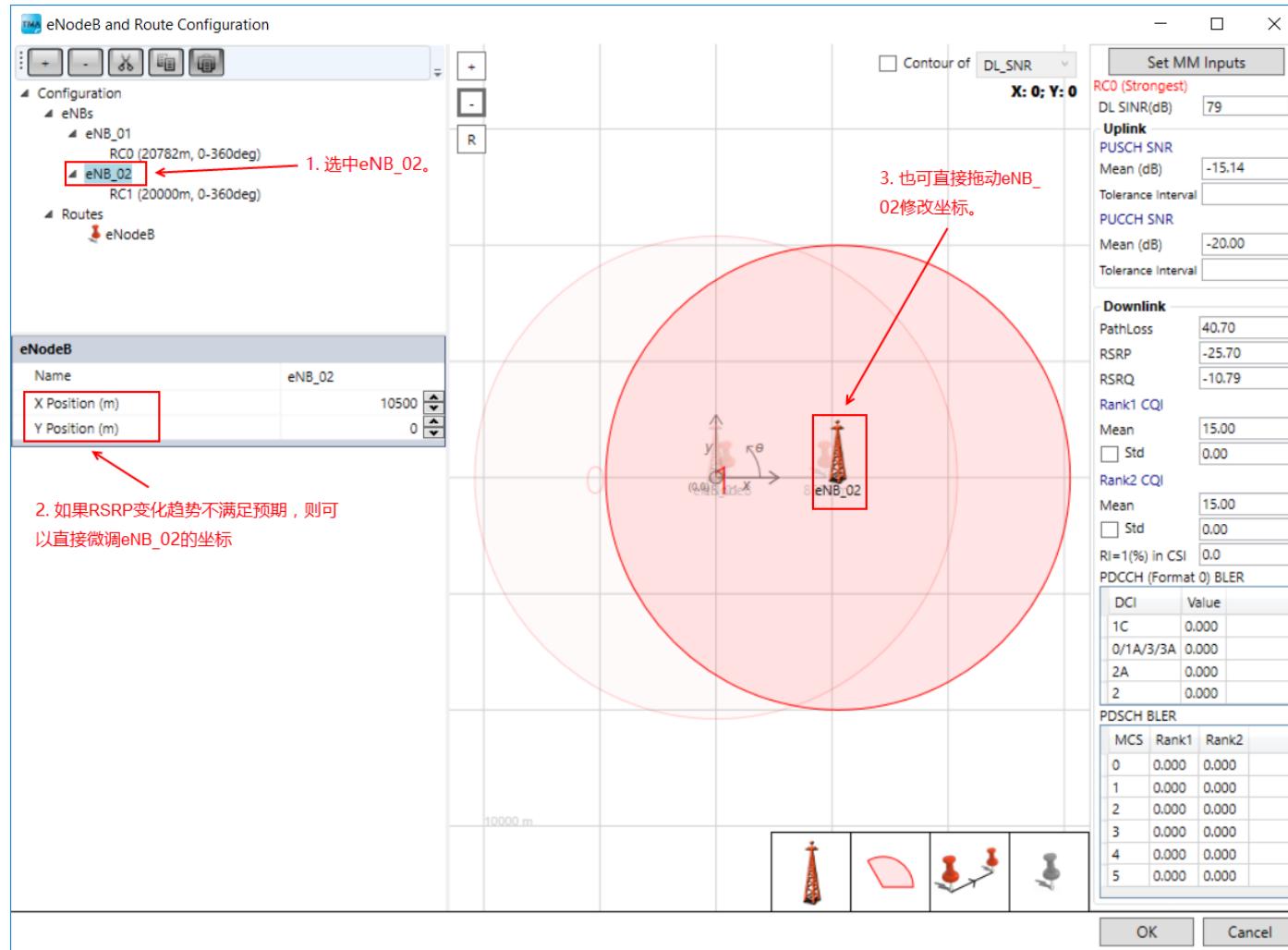
预览RSRP变化趋势



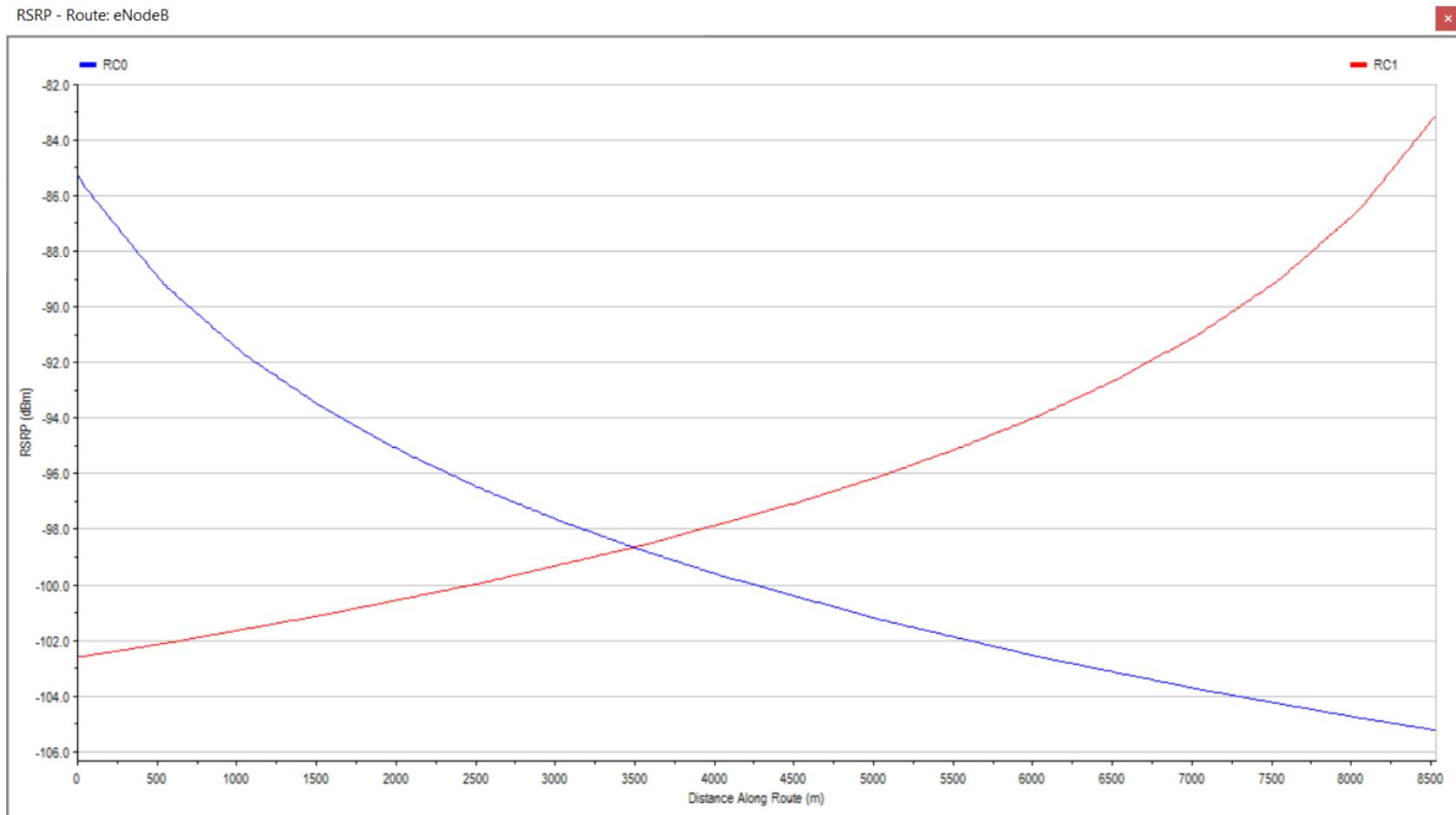
- 如果RSRP变化趋势不满足预期，请微调eNB或路径的位置。



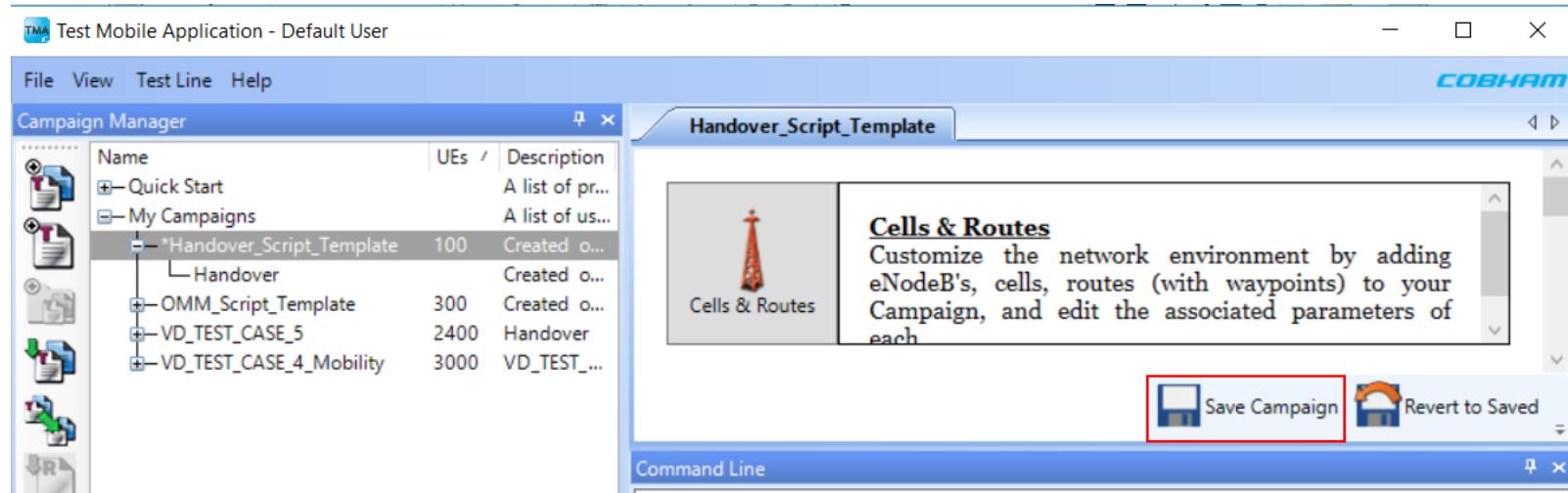
微调eNB_02坐标



- 调整eNB_02坐标后，再次预览RSRP，直至变化趋势符合预期。



- Handover相关OMM参数选取完成，点击**Save Campaign**及时保存相关配置。

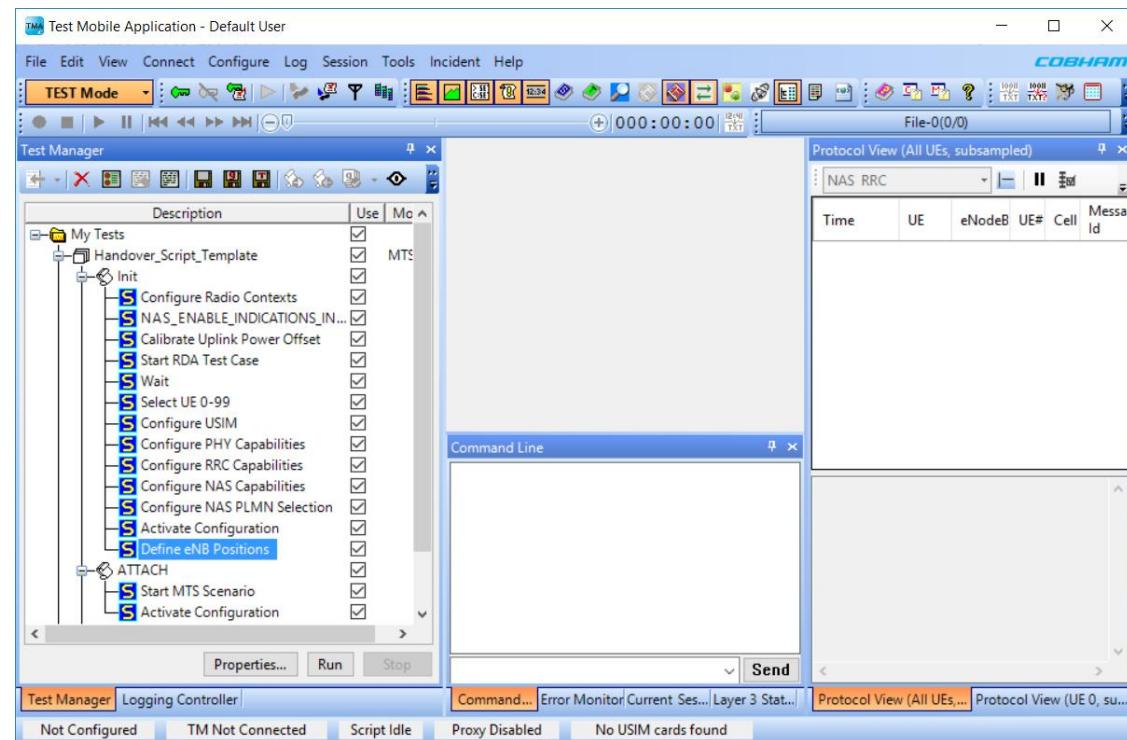


- Handover相关OMM参数如下所示。

eNB Id	eNB Position (X, Y)	DL Frequency (MHz)	Sector Start	Sector End	Cell Range (m)	Reference Signal Power (dBm)
0	(0, 0)	2585	0	360	20000	15
1	(10500, 0)	1900	0	360	20000	15

Route	Waypoint 1		Waypoint 2		Loc (dBm)
	X (m)	Y (m)	X (m)	Y (m)	
	954	-11	9487	9	

- 关闭并重新打开TMA，选择EXT-MUE GUI.



EMUE GUI Script

- 根据E500 GUI确定的的OMM参数配置，更新EXT-MUE脚本OMM相关设置，主要包括：
 - Define eNB Positions
 - Start MTS Scenario

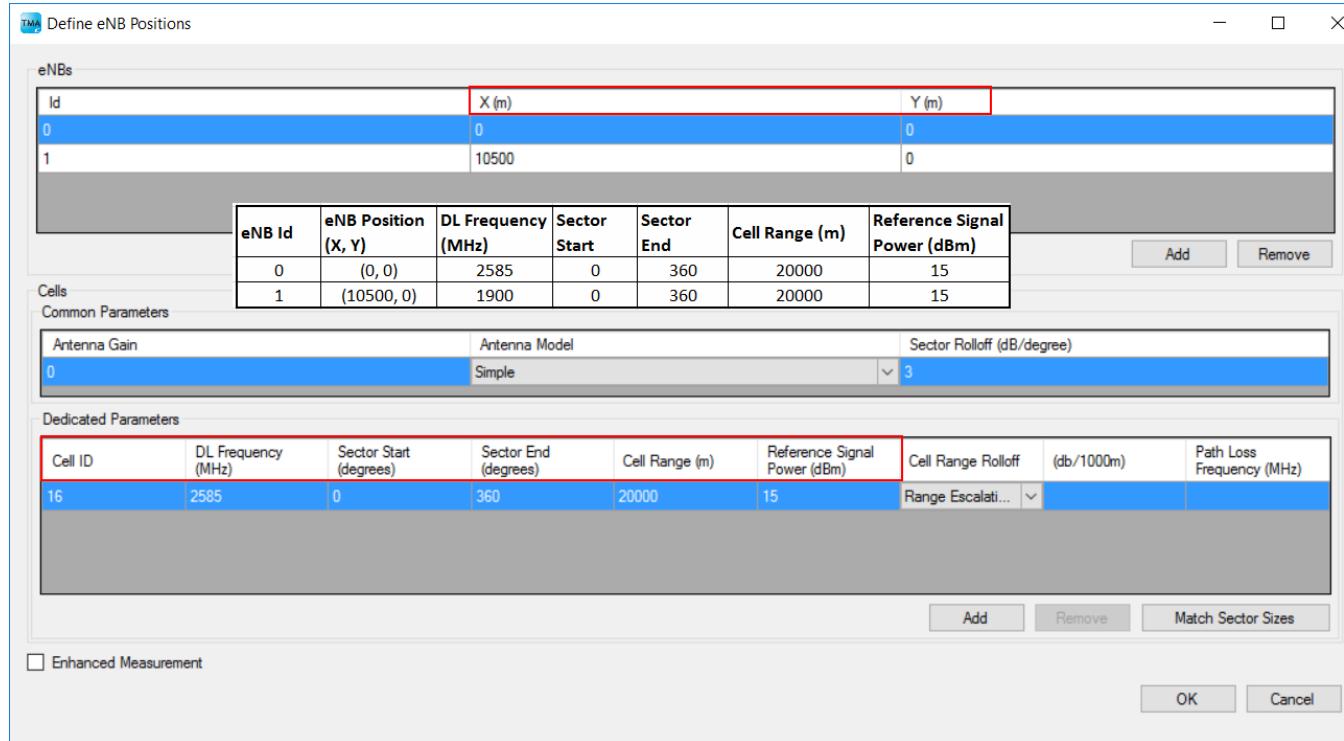
Description	Use	Mo ^
My Tests	<input checked="" type="checkbox"/>	
Handover_Script_Template	<input checked="" type="checkbox"/>	MTS
Init	<input checked="" type="checkbox"/>	
Configure Radio Contexts	<input checked="" type="checkbox"/>	
NAS_ENABLE_INDICATIONS_IN...	<input checked="" type="checkbox"/>	
Calibrate Uplink Power Offset	<input checked="" type="checkbox"/>	
Start RDA Test Case	<input checked="" type="checkbox"/>	
Wait	<input checked="" type="checkbox"/>	
Select UE 0-99	<input checked="" type="checkbox"/>	
Configure USIM	<input checked="" type="checkbox"/>	
Configure PHY Capabilities	<input checked="" type="checkbox"/>	
Configure RRC Capabilities	<input checked="" type="checkbox"/>	
Configure NAS Capabilities	<input checked="" type="checkbox"/>	
Configure NAS PLMN Selection	<input checked="" type="checkbox"/>	
Activate Configuration	<input checked="" type="checkbox"/>	
Define eNB Positions	<input checked="" type="checkbox"/>	
ATTACH	<input checked="" type="checkbox"/>	
Start MTS Scenario	<input checked="" type="checkbox"/>	
Activate Configuration	<input checked="" type="checkbox"/>	

Handover Script Template

COBHAM

Define eNB Positions

- 更新**Define eNB Positions**参数配置。



备注：1. 此处的eNB是逻辑上的概念，并不完全等价于物理上的eNB；定义多个eNB主要是为了使全向小区分布在不同位置，从而实现部分覆盖。

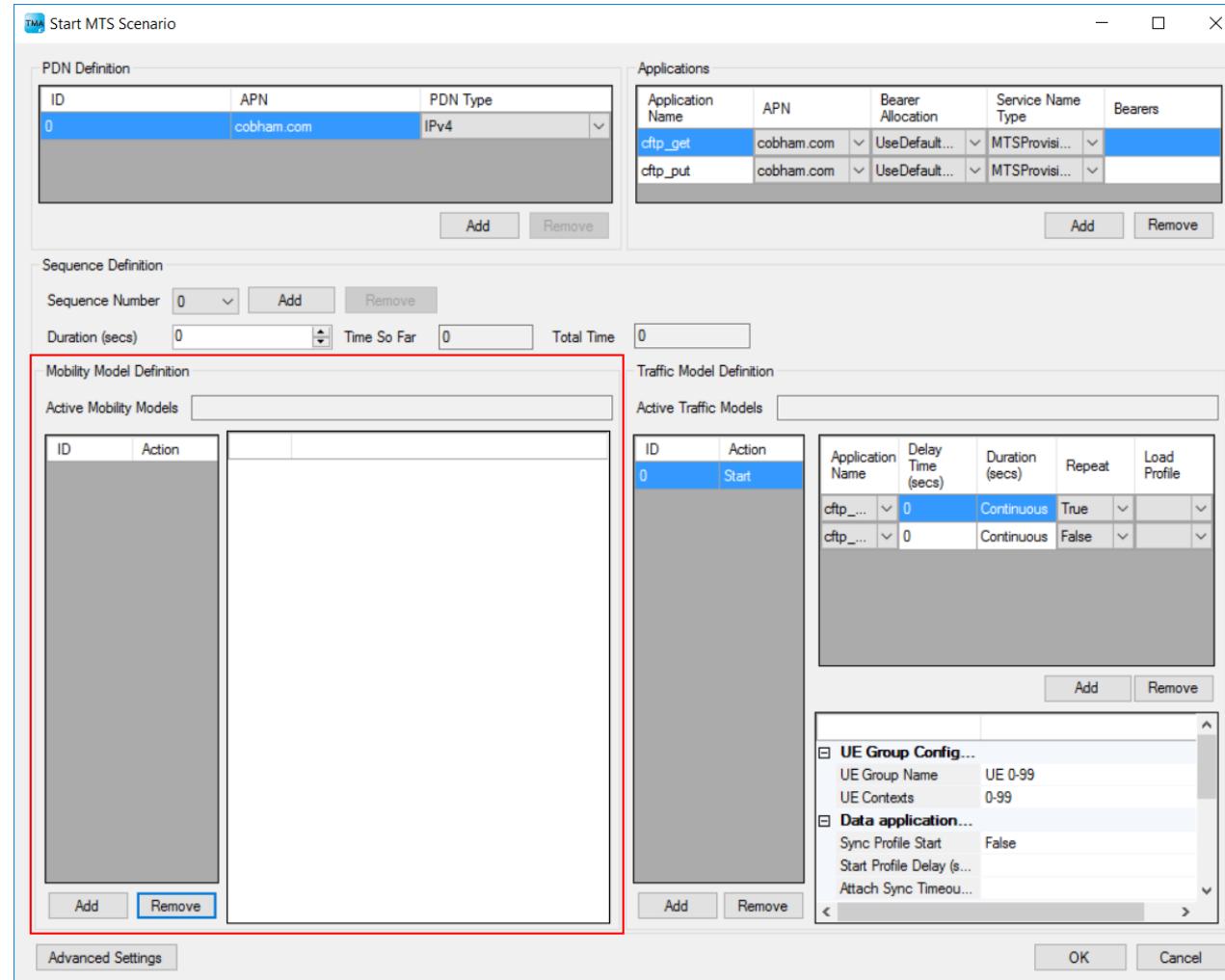
- 如果**Define eNB Positions**定义多个小区，小区参数及小区排序最好与**Configure Radio Contexts**完全一致。
- 如果测试Small Cell，请务必勾选左下角的**Enhanced Measurement**。

Handover Script Template

COBHAM

Start MTS Scenario

- 添加或更新**Mobility Model Definition.**

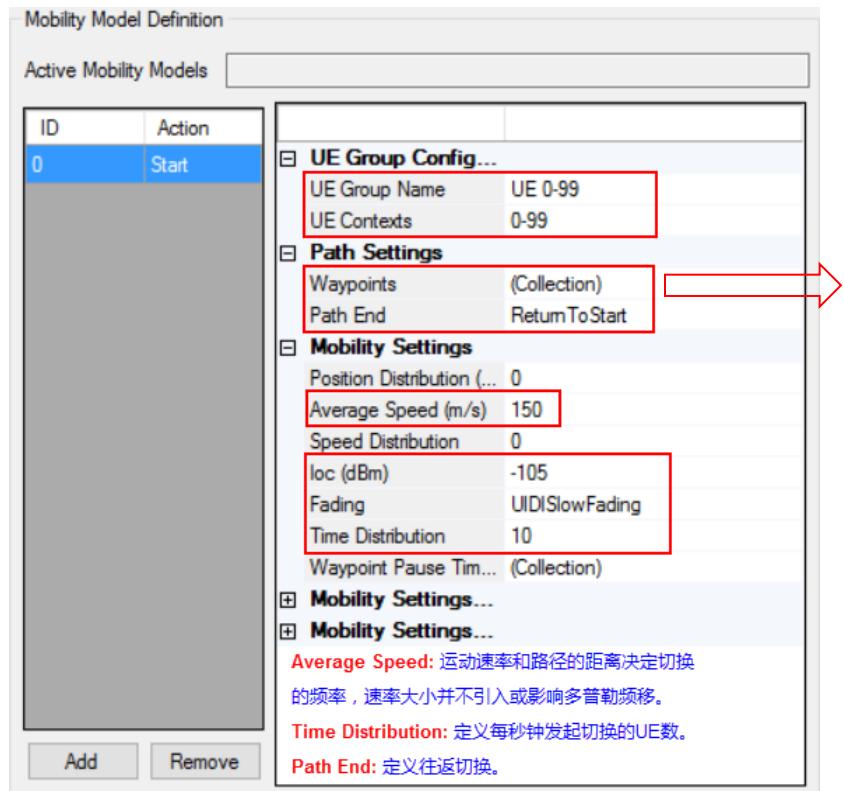


Handover Script Template

COBHAM

Start MTS Scenario

- 添加或更新Handover信道模型
 - 定义信道模型运行于哪个UE Group (UE Contexts).
 - 设置Waypoints/Path End/Average Speed/Ioc/Fading/Time Distribution.



Route	Waypoint 1		Waypoint 2		loc (dBm)
	X (m)	Y (m)	X (m)	Y (m)	
	954	-11	9487	9	-105

Modal dialog titled 'Edit Waypoints':

	X (m)	Y (m)
▶	954	-11
	9487	9

Buttons: OK, Cancel.

Handover Script Template

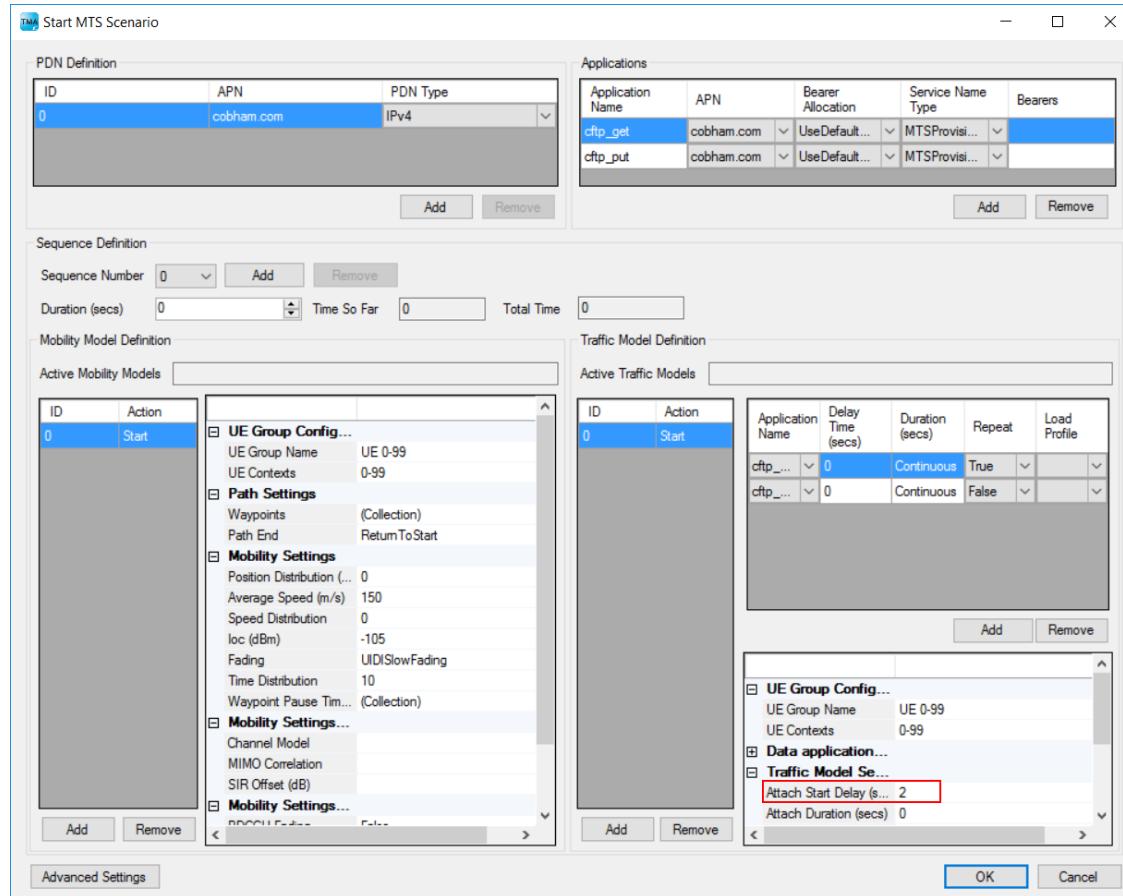
COBHAM

Path End	Enum	0	1	
	0 = stop 1 = return to start. Return retraces back through the waypoints and then repeats. 2 = loop to start. Traverse back to first waypoint and loops back through path.			
[> Time Distribution]	Int	0	1000	0
	Defines the rate (in UEs/s) at which UEs in the group start moving when the MM starts to provide a position stagger capability. If not provided the default value of 0 applies — all UEs in the group start together when the MM starts. If provided then the designated number of UEs start along the path per second. This can be used to easily distribute the UEs along the path and determine the rate at which UEs reach a certain point: for example, at which handover would be triggered. Note that due to the nature of the position simulation in the EXT-MUE\500 it is not guaranteed that the UEs are evenly spaced in time or position.			

Handover Script Template

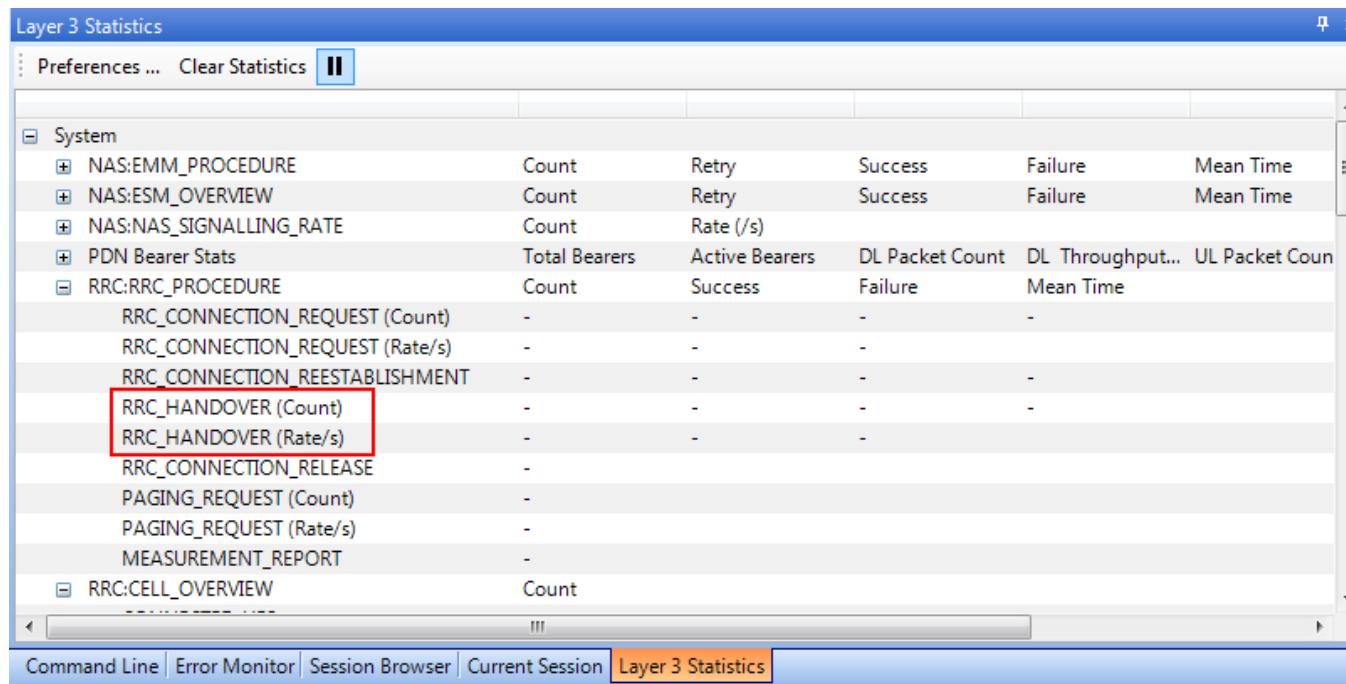
COBHAM

- 通过以上步骤，EXT-MUE脚本Handover相关的OMM设置完成。



备注：为了预留一定时间使OMM生效，**Attach Start Delay**至少需设置2秒。

- 测试过程中
 - Command Line Window打印切换相关的信息.
 - **Protocol View**高亮显示切换相关*RRConnectionReconfiguration*.
 - 测试过程中，**Layer 3 Statistics**实时查看切换相关统计。



附录

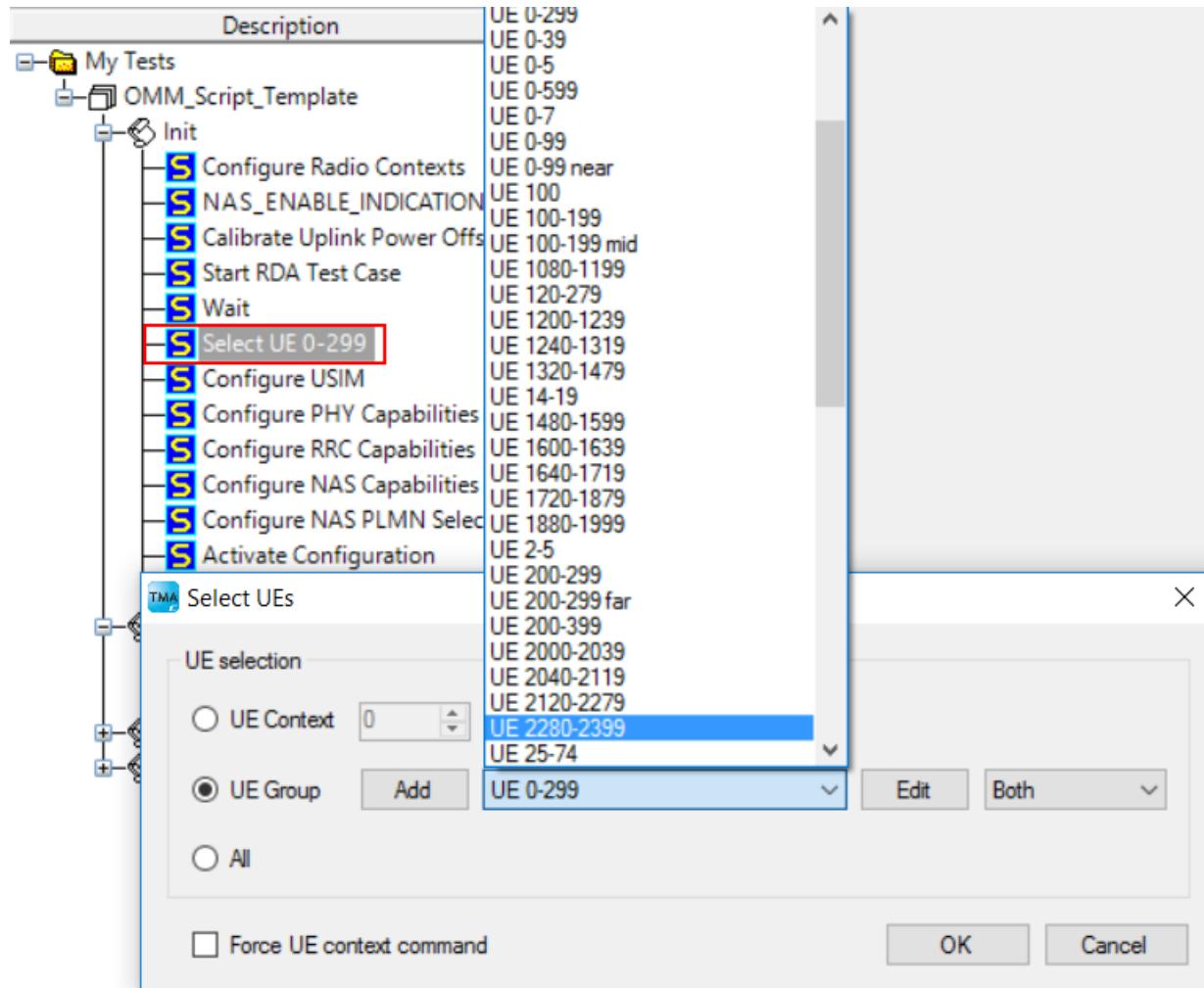


添加UE Group

COBHAM

Select UEs

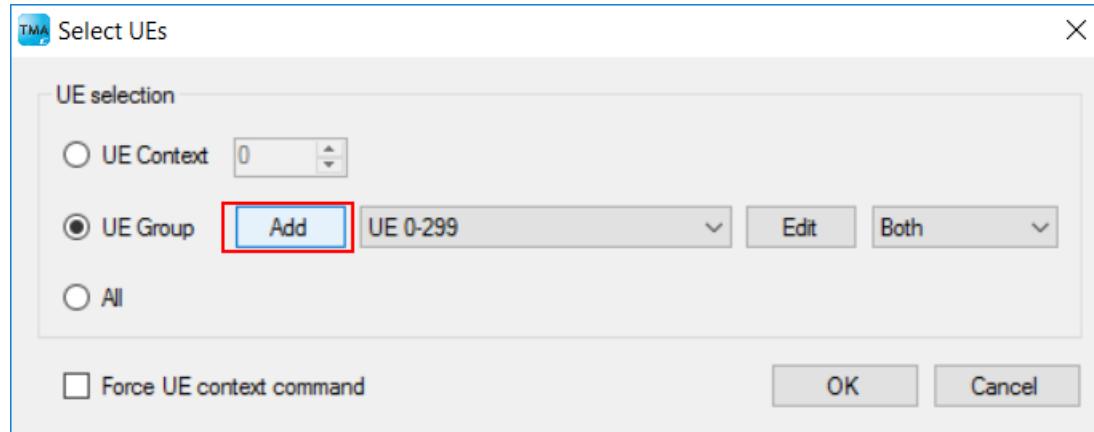
- UE Group可以从已定义的UE Group列表选择。



添加UE Group

Select UEs

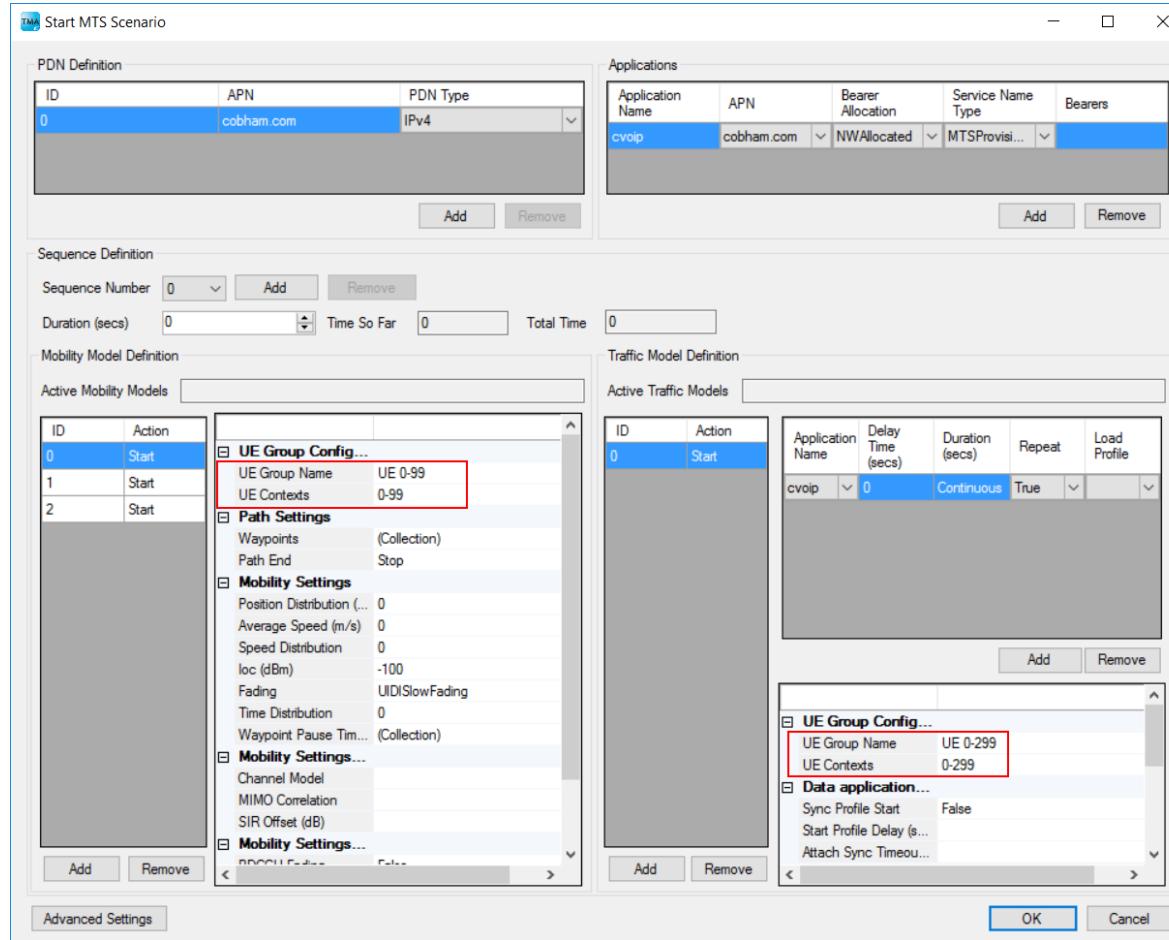
- 如果UE Group列表无法找到合适的UE Group，那么请添加新的UE Group。



添加UE Group

Start MTS Scenario – UE Group Configuration

- Mobility Model和Traffic Model需要制定运用于哪个UE Group（哪些UE）。



添加UE Group

Start MTS Scenario – UE Group Configuration

- 如果UE Group列表无法找到合适的UE Group，请创建新的UE Group。

The screenshot displays two main panels from the Cobham MTS software interface:

Mobility Model Definition

Active Mobility Models

ID	Action
0	Start
1	Start
2	Start

UE Group Config...

- UE Group Name:** UE 0-99
- UE Contexts:** UE 0, DLUDP, DLFTP
- Path Settings**

 - Waypoints: UE 200-299, UE 100-199, UE 0-99 (highlighted)
 - Path End: UE 0-299

- Mobility Settings**

 - Position Distribution (m/s): Average Speed (m/s) <Create new UE group> (highlighted)
 - Average Speed (m/s): 0
 - Speed Distribution: 0
 - loc (dBm): -100
 - Fading: UIDISlowFading
 - Time Distribution: 0
 - Waypoint Pause Time (Collection):

- Mobility Settings...**

 - Channel Model
 - MIMO Correlation
 - SIR Offset (dB)

Traffic Model Definition

Active Traffic Models

ID	Action	Application Name	Delay Time (secs)	Duration (secs)	Repeat	Load Profile
0	Start	cvoip	0	Continuous	True	

Add **Remove**

UE Group Config...

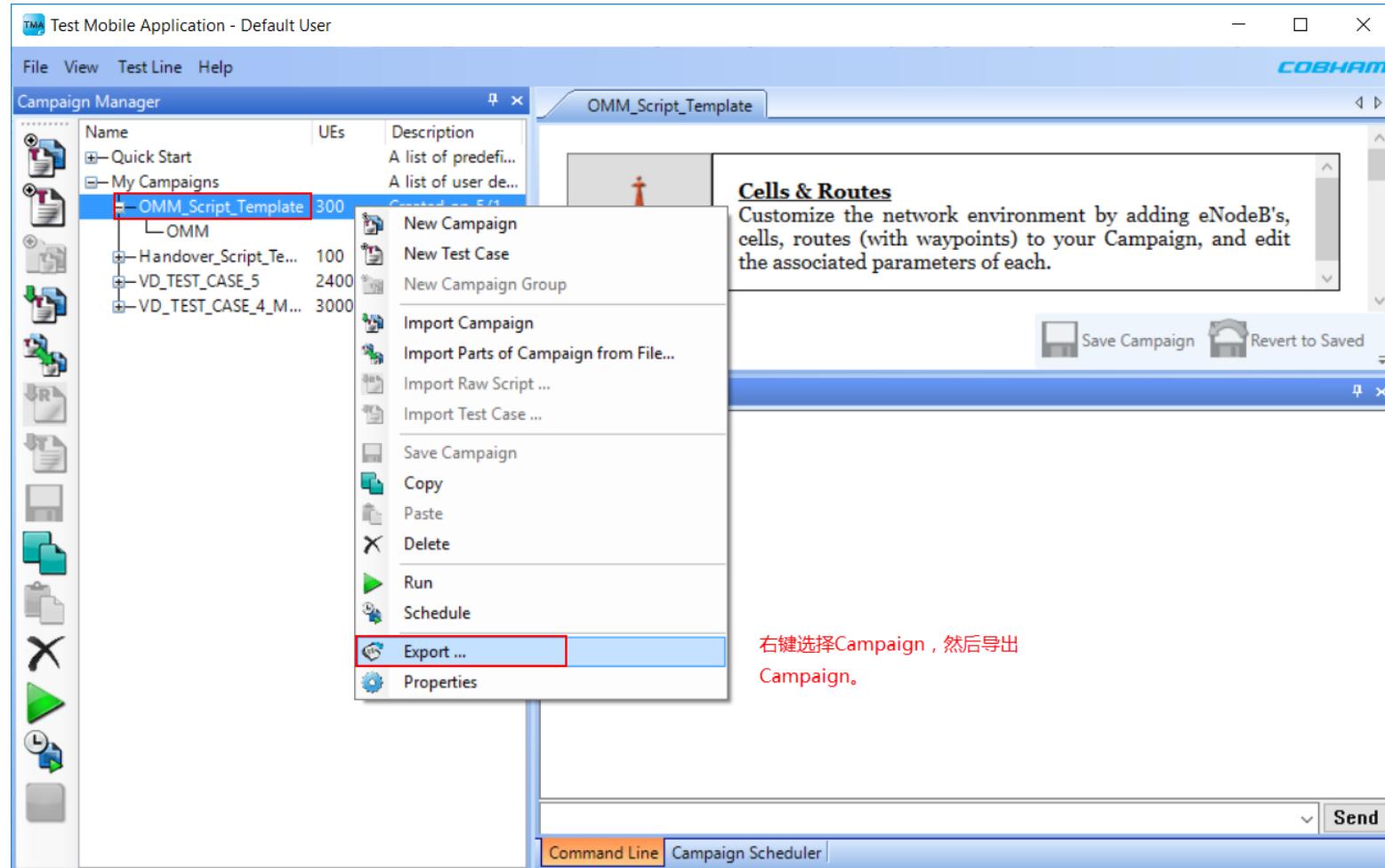
- UE Group Name:** UE 0-299
- UE Contexts:** DLUDP, DLFTP
- Data application...**

 - Sync Profile Start
 - Start Profile Delay (s...)
 - Attach Sync Timeout...
 - UE 0-99 (highlighted)
 - UE 0-299 (highlighted)

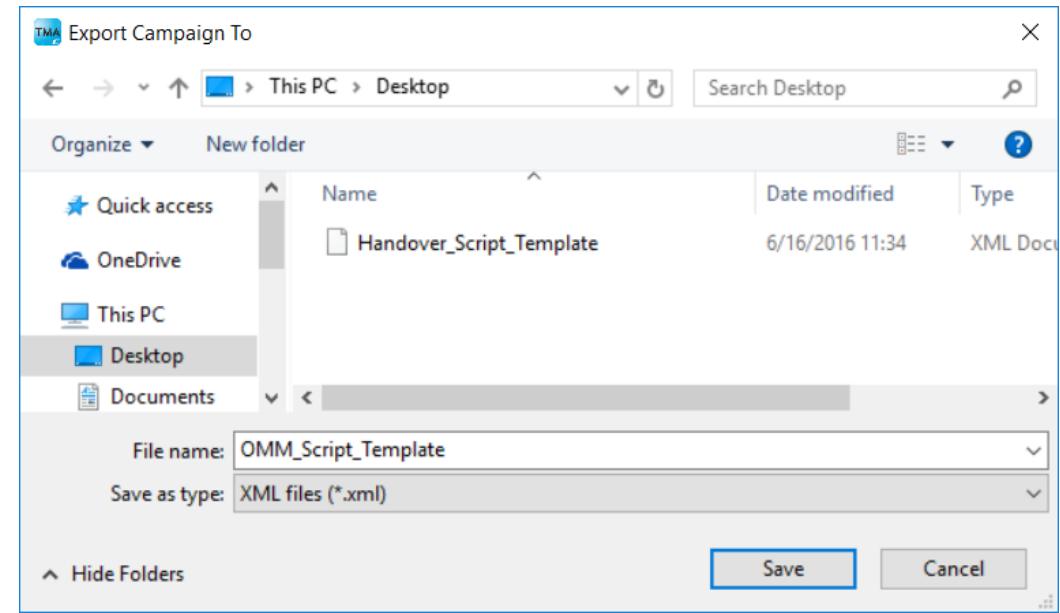
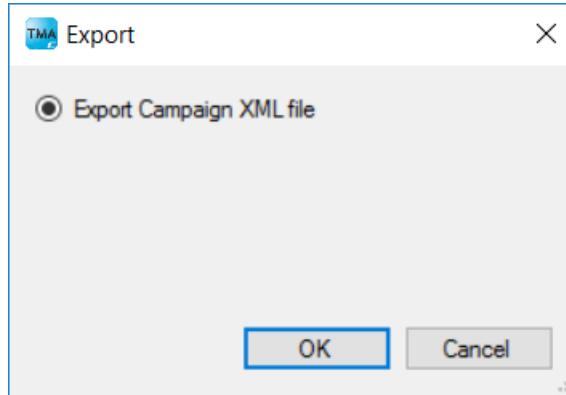
- <Create new UE group> (highlighted)

Add **Remove**

- 导出Campaign，保存为.xml格式。

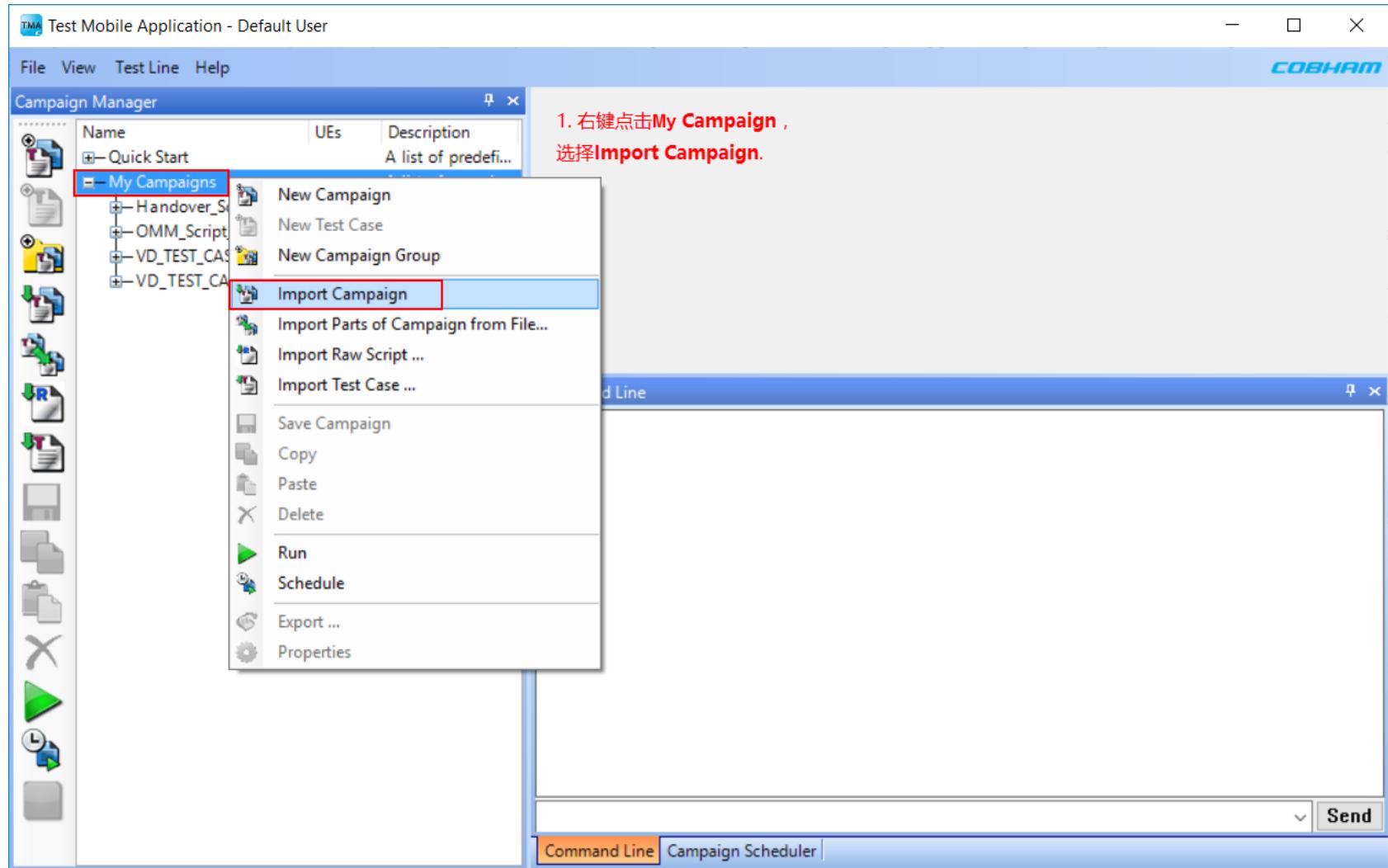


- 选择合适的保存路径和文件名



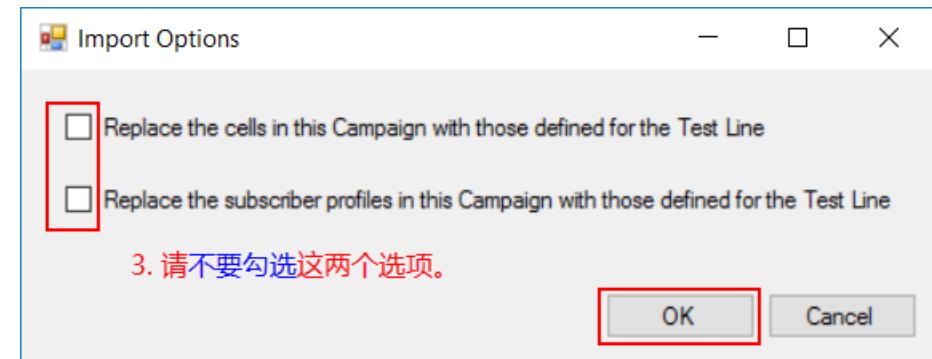
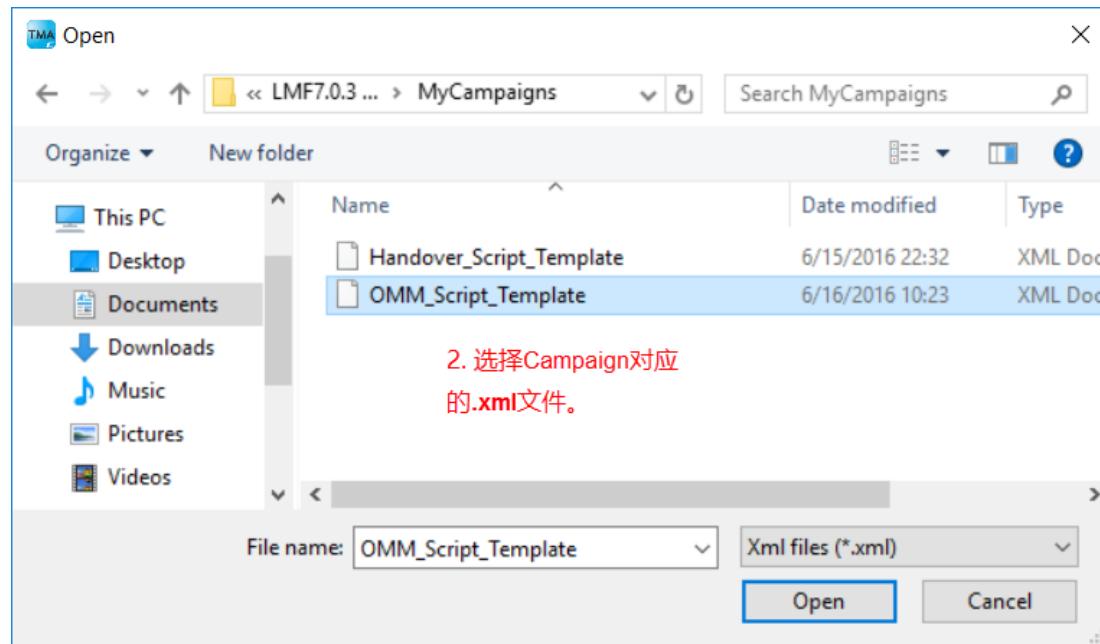
导入Campaign

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导入Campaign

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- E500_CapacityTest_TMA.pdf
- TM500LTE_TMA_UserGuide.pdf
- TM500LTE_MTS.pdf
- TM500LTE_CommandReference.pdf
- TM500LTE_MeasurementReference.pdf

Change History

COBHAM

Version	Date	Author	Reviewed by	Approved by	Change history
0.1	06/16/2016	Klein Jiang	NA	NA	Initial draft
0.2	06/20/2016	Klein Jiang	NA	NA	Reviewed by Corey/Sining



Connected – Seamless – Wireless