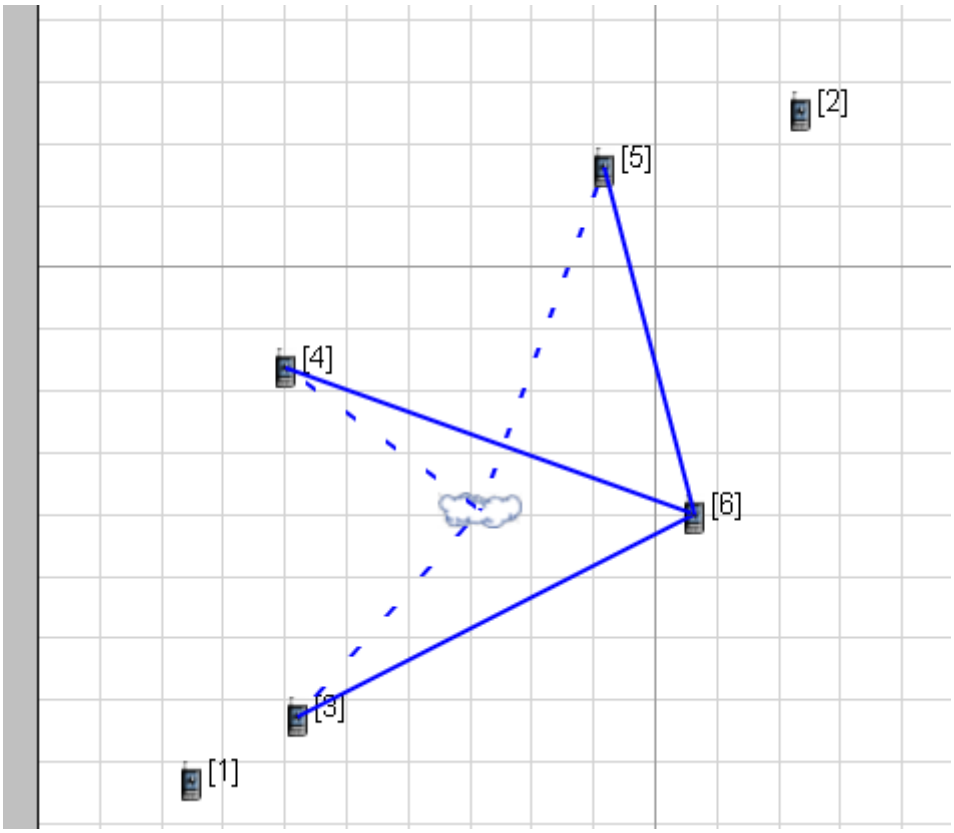
EXata学习（03）：GSM网络场景

目的：掌握用EXata仿真GSM移动网络的基本方法

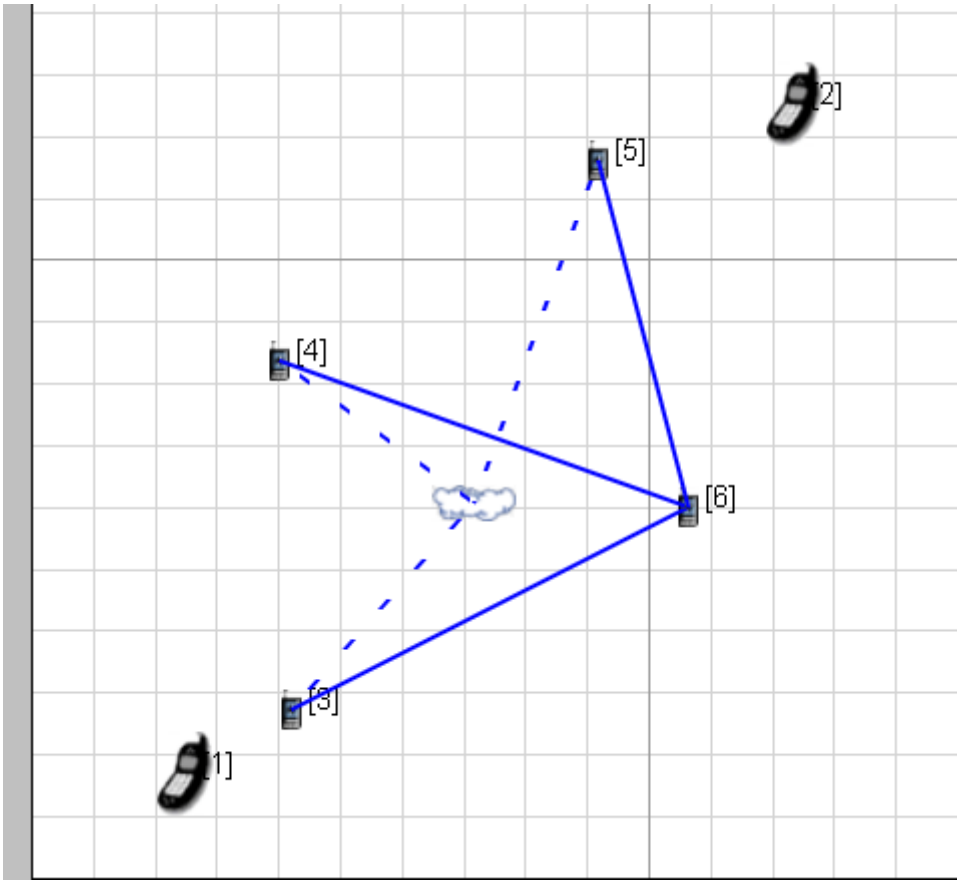
资料：参考D:\Scalable\exata\5.1\scenarios\cellular\gsm\handover

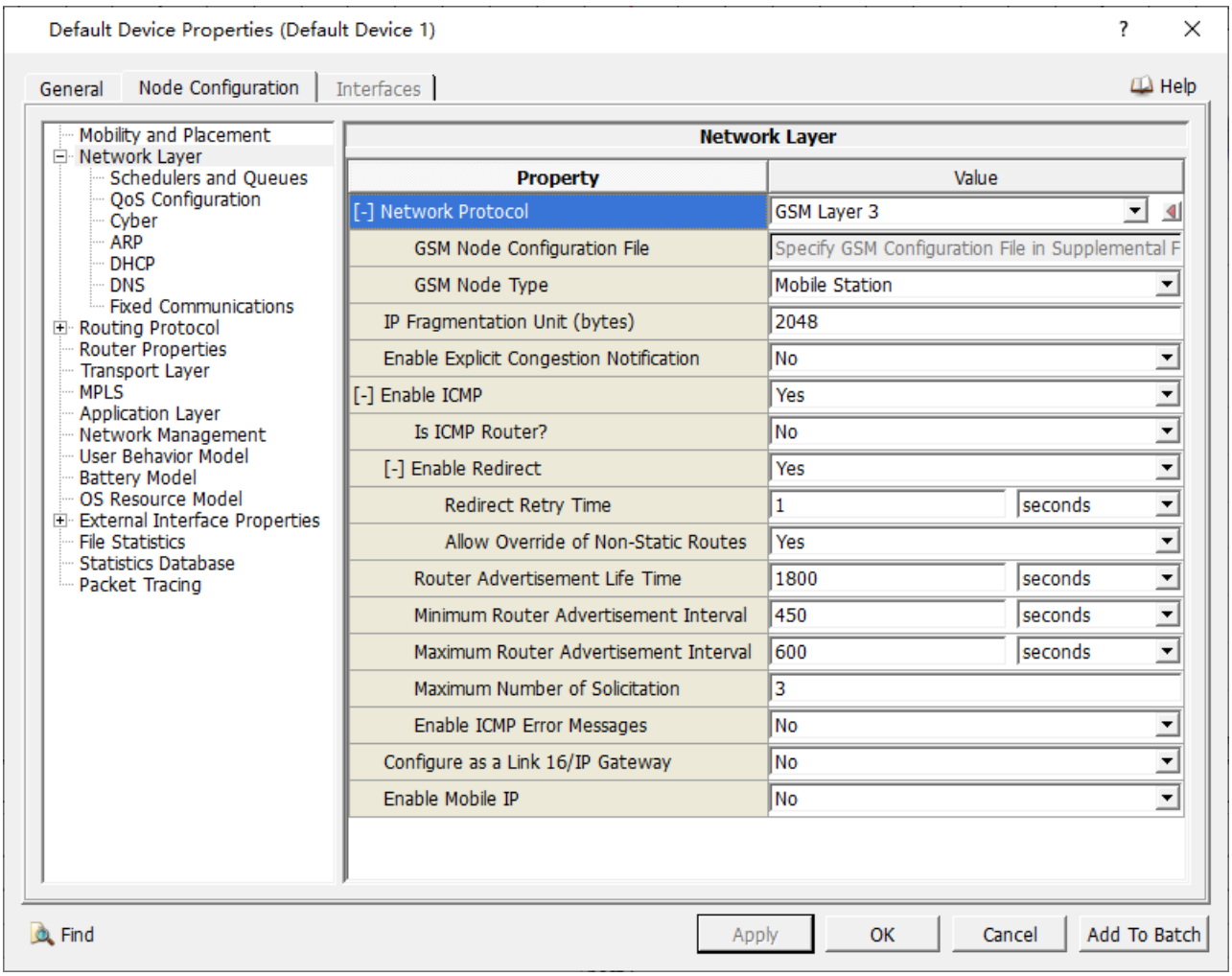
步骤：

1. 创建两个default devices节点1和2，拟作为MS，保存scenario文件：myGSM
2. 创建节点3-5拟作为BS，节点6拟作为MSC；
3. 有线连接3-5到节点6，即三个BSs属于同一个MSC；
4. 创建一个无线子网，连接3-5到此无线子网。至此场景如下图



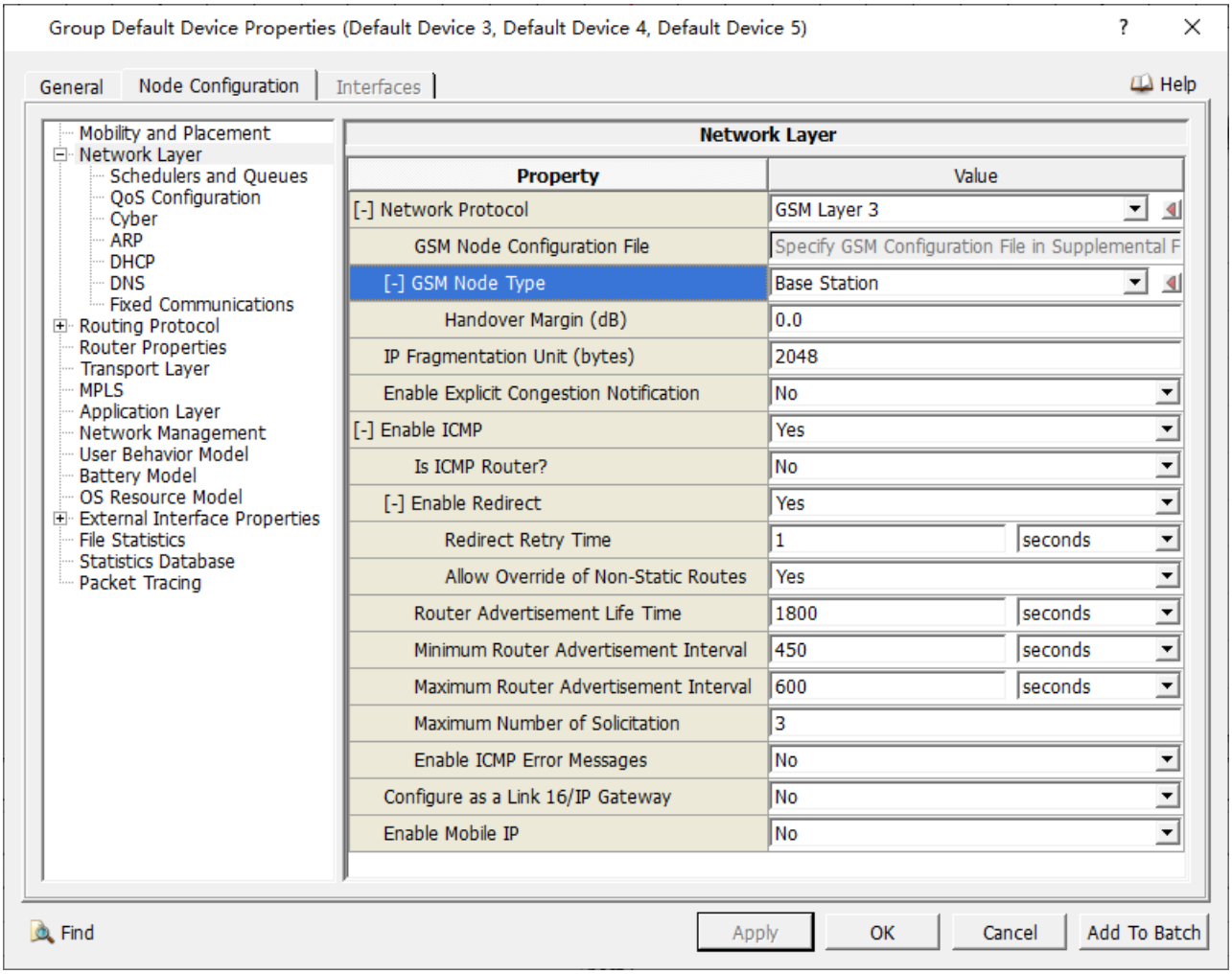
5. 配置节点1和2为MS：
   - 复制系统Icon文件：从D:\Scalable\exata\5.1\gui\icons下复制GSM-MS、GSM-BS和GSM-MSC三个png文件，作为2D和3D ICon文件。
   - 设定节点1和2的 2D ICon和 3D Icon 均为GSM-MS.png文件: Table View：Nodes页选择节点1和2，分别命名为MS-A和MS-B
   - 在Node Configureation: Network Layer中设定Network Protocol为 GSM Layer 3，GSM Node Type为 Mobile Station



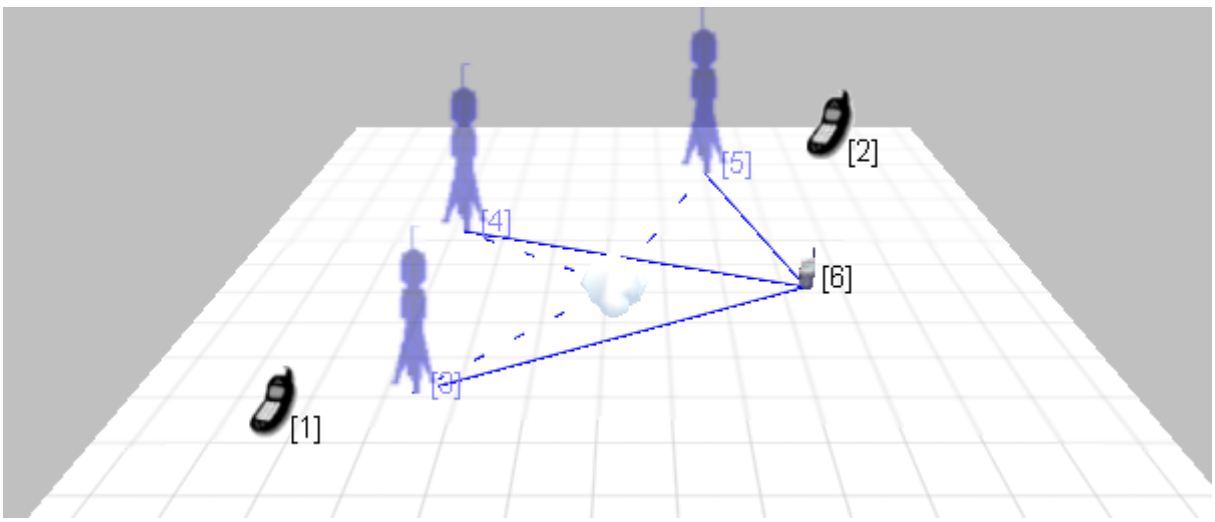


6. 配置节点3–5为BS：
    - 方法类似MS设置，将三个节点的Network Protocol设定为GSM Layer 3，不同的是GSN Node Type设定为

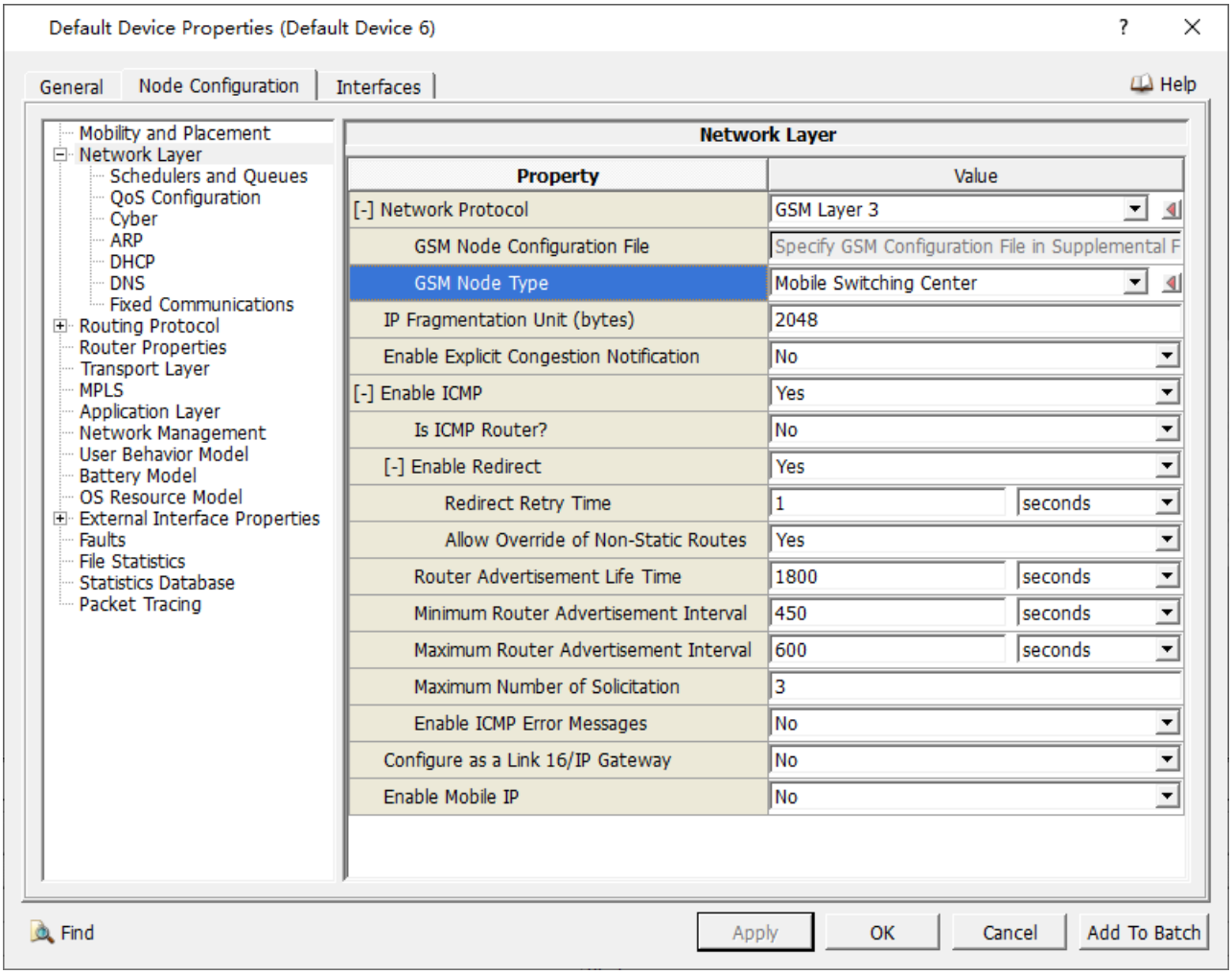
Base Station



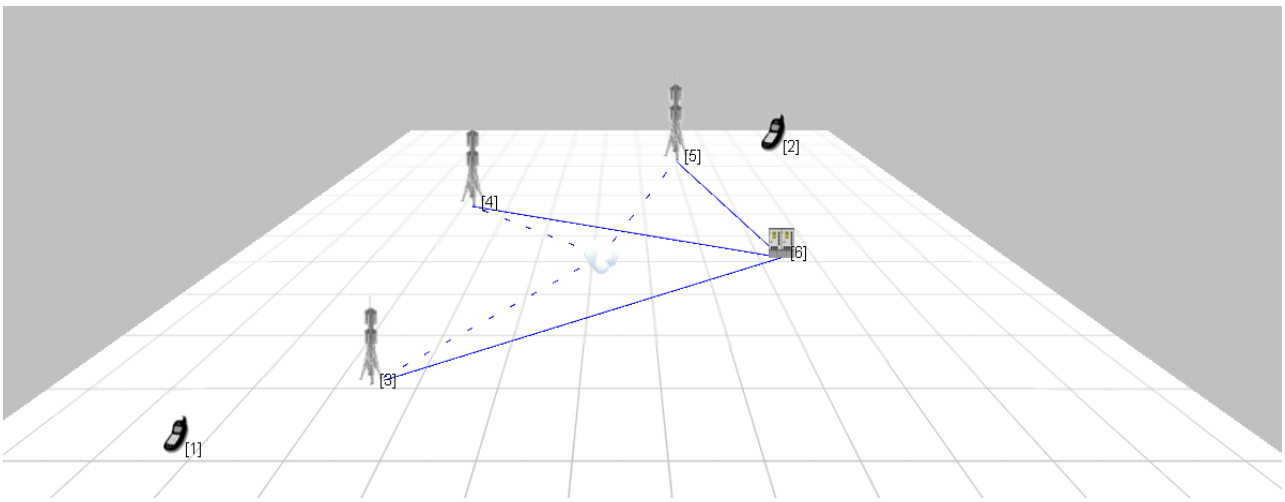
- 分别重命名为BS1、BS2、BS3
- 设定其2D和3D ICon为GSM–BS，至此，场景如下图



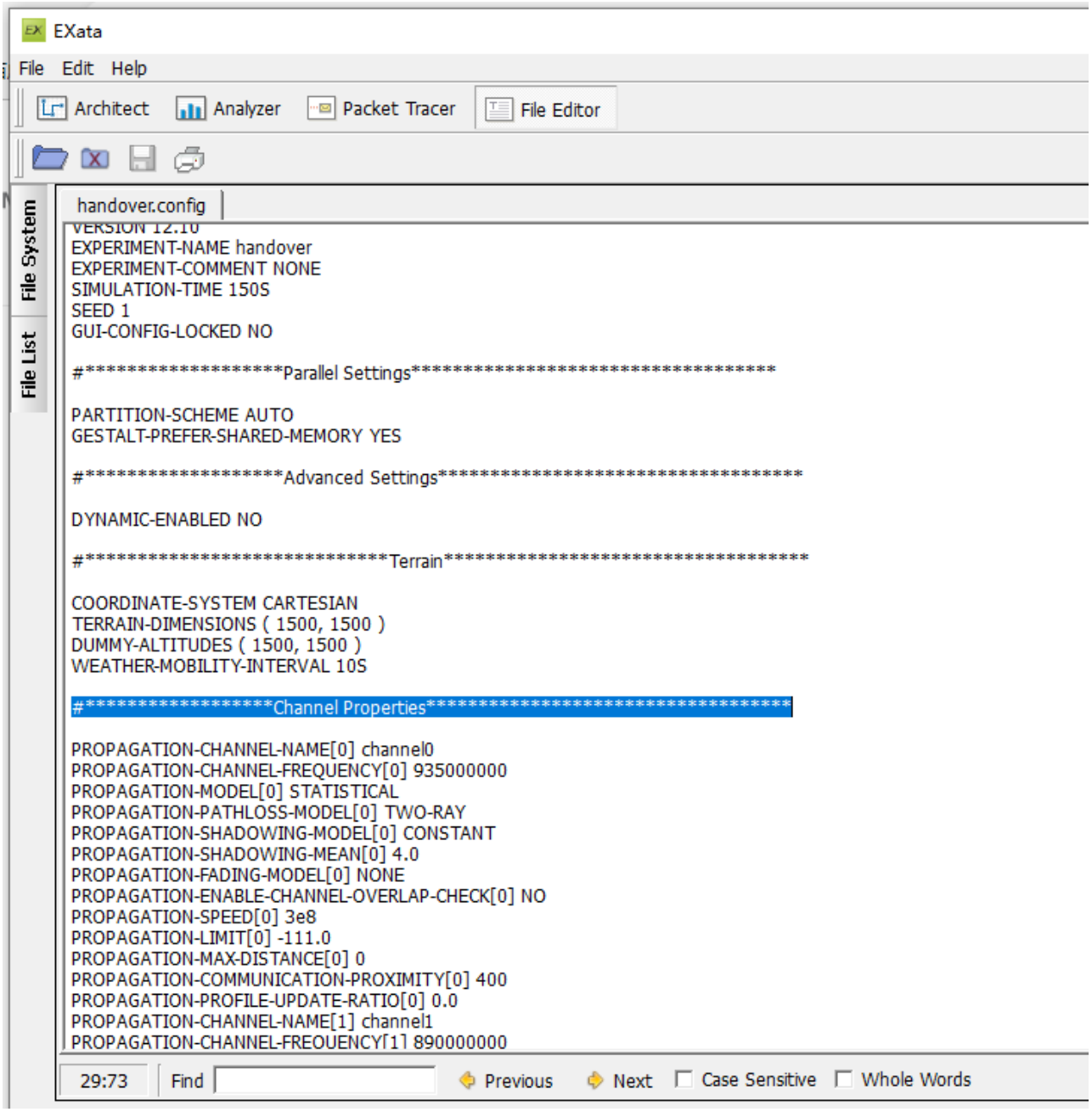
7. 设定节点6为MSC：
   - 方法类似MS和BS的设定方法，不同的是GSM Node Type选择Mobile Switching Center



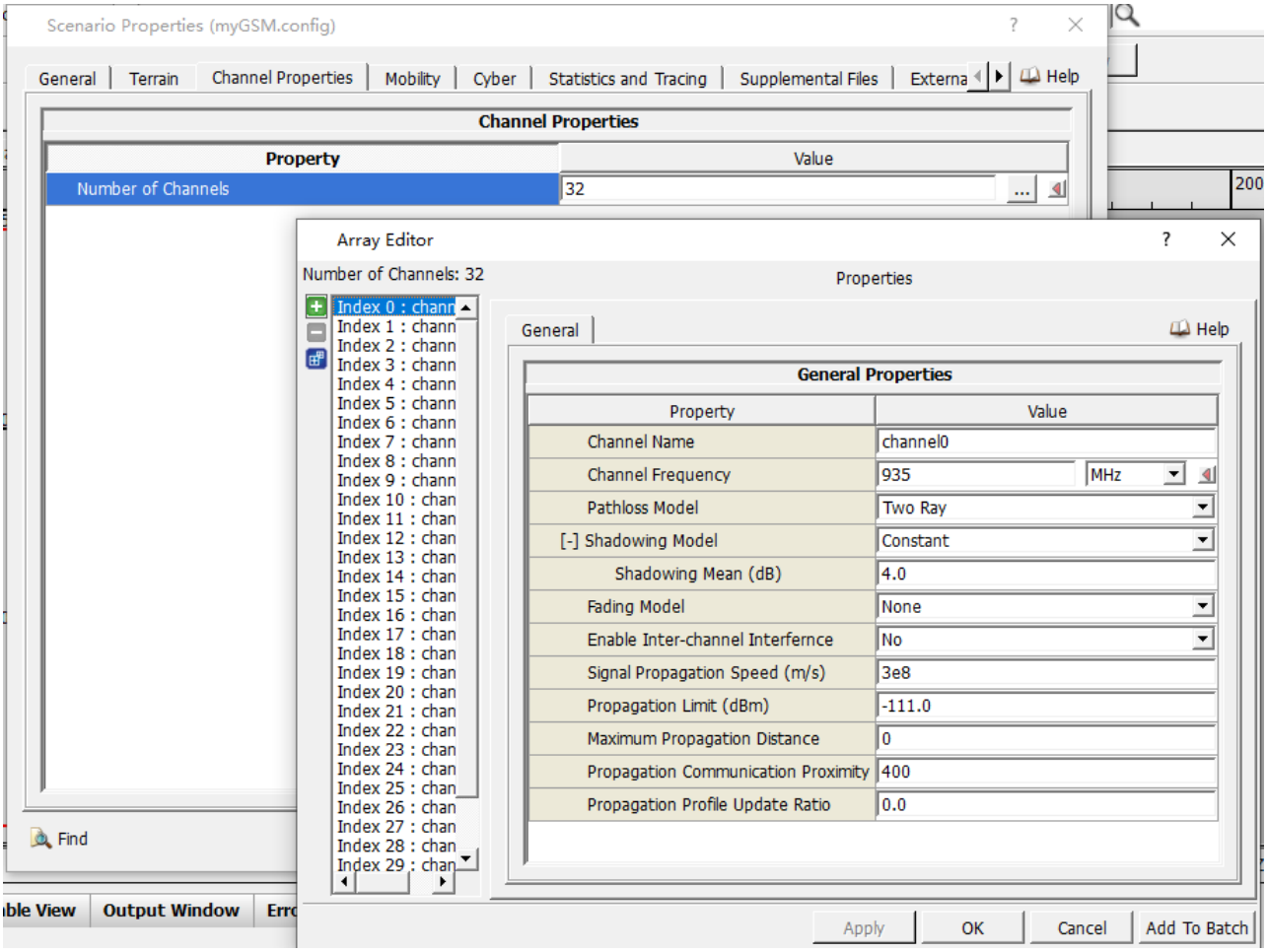
- 选择2D和3D ICon为GSM–MSC，至此，场景如下图



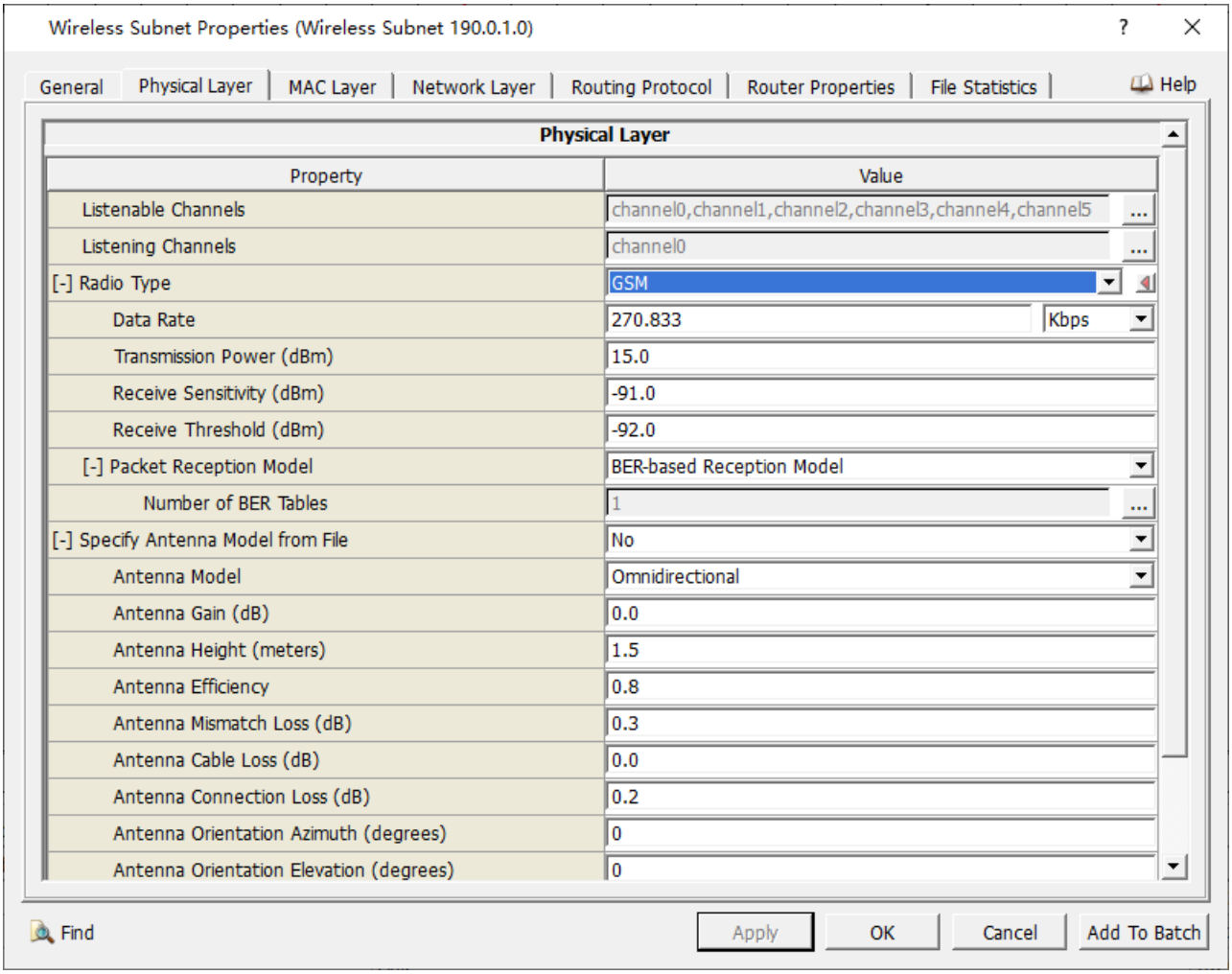
8. 设定场景的Channel Properties：Scenario Properties：Channel Properties，设定Number of Channels为32，仿造GSM/handover场景中。【用到Open Current Scenario in File Editor功能】
   - 在File Editor中打开GSM/Handover场景；
   - 复制Channel Properties段的内容行



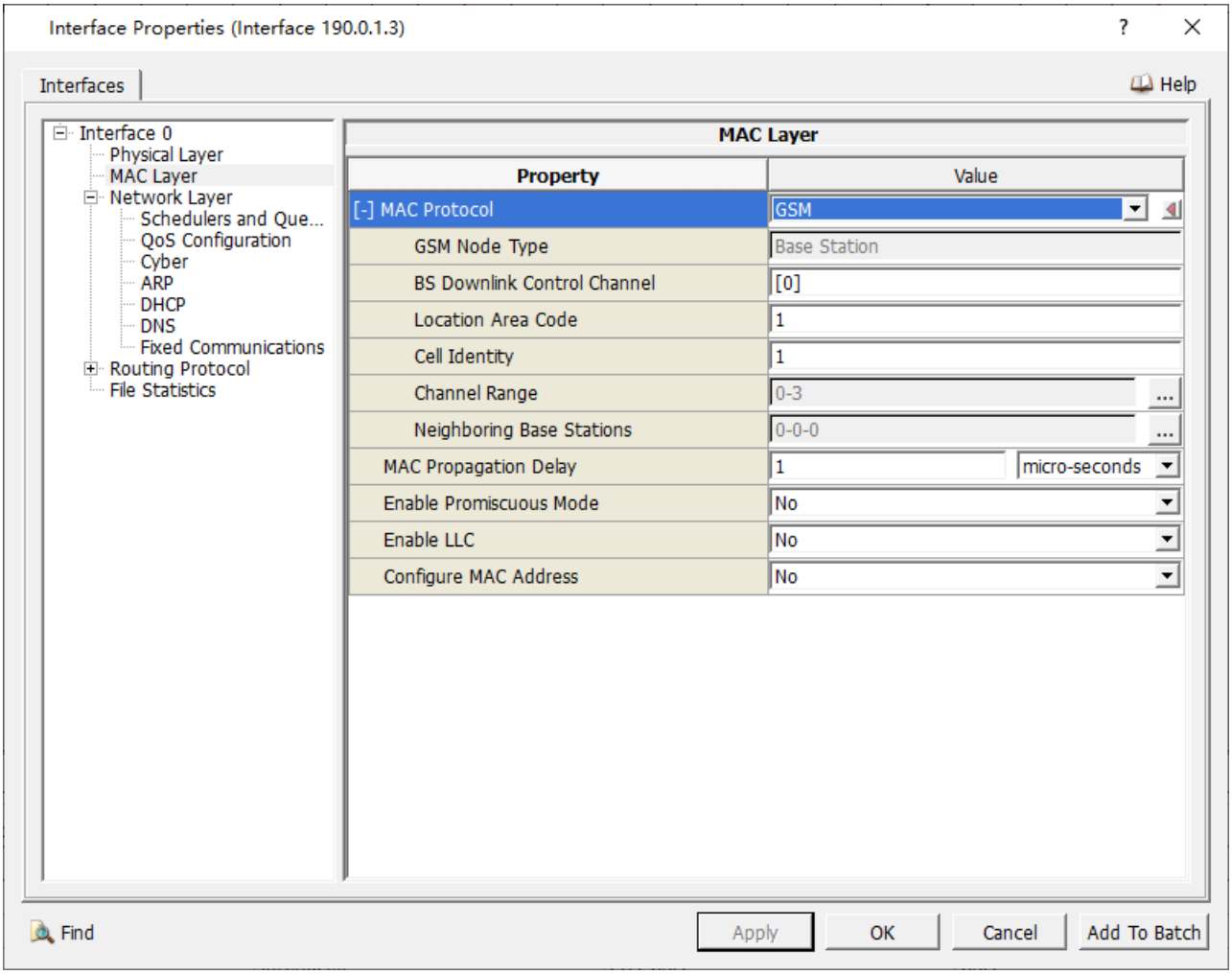
- 粘贴到myGSM场景文件中的Channel Properties段落部分，【注意：需要保存myGSM场景后，重新打开，配置框中才能显示更新后的Number of Channels】，原为1，现在为32，而且是GSM频段。



9. 设定无线子网参数
   - Table View：Network中选择Wireless Subnet，双击打开属性框；
   - 在在Physical Layer的Listenable Channels中选择部分或全部Channels；Listening Channels为Channel0，即整个子网监听Channel0【问题：能否选择多个信道？】；Radio Type中选择GSM。



- 此时，查看该无线子网的三个BS的interface0的Physical Layer属性则与子网属性一致。
- 设定无线子网接口的**MAC层**：Table View：**Interfaces**，选择三个基站的PHY-GSM接口，设定其MAC层为GSM，注意观察节点类型为Base Station



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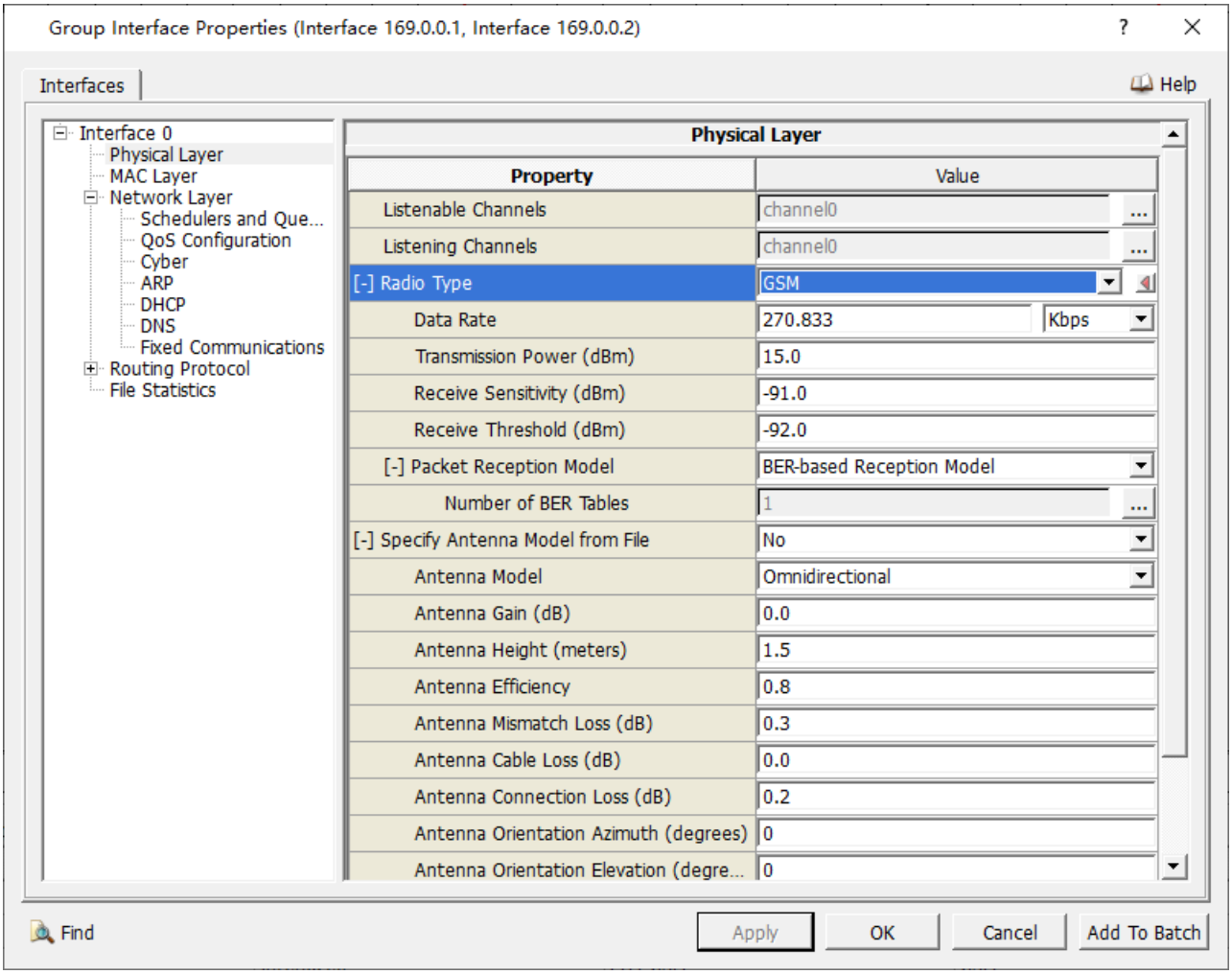
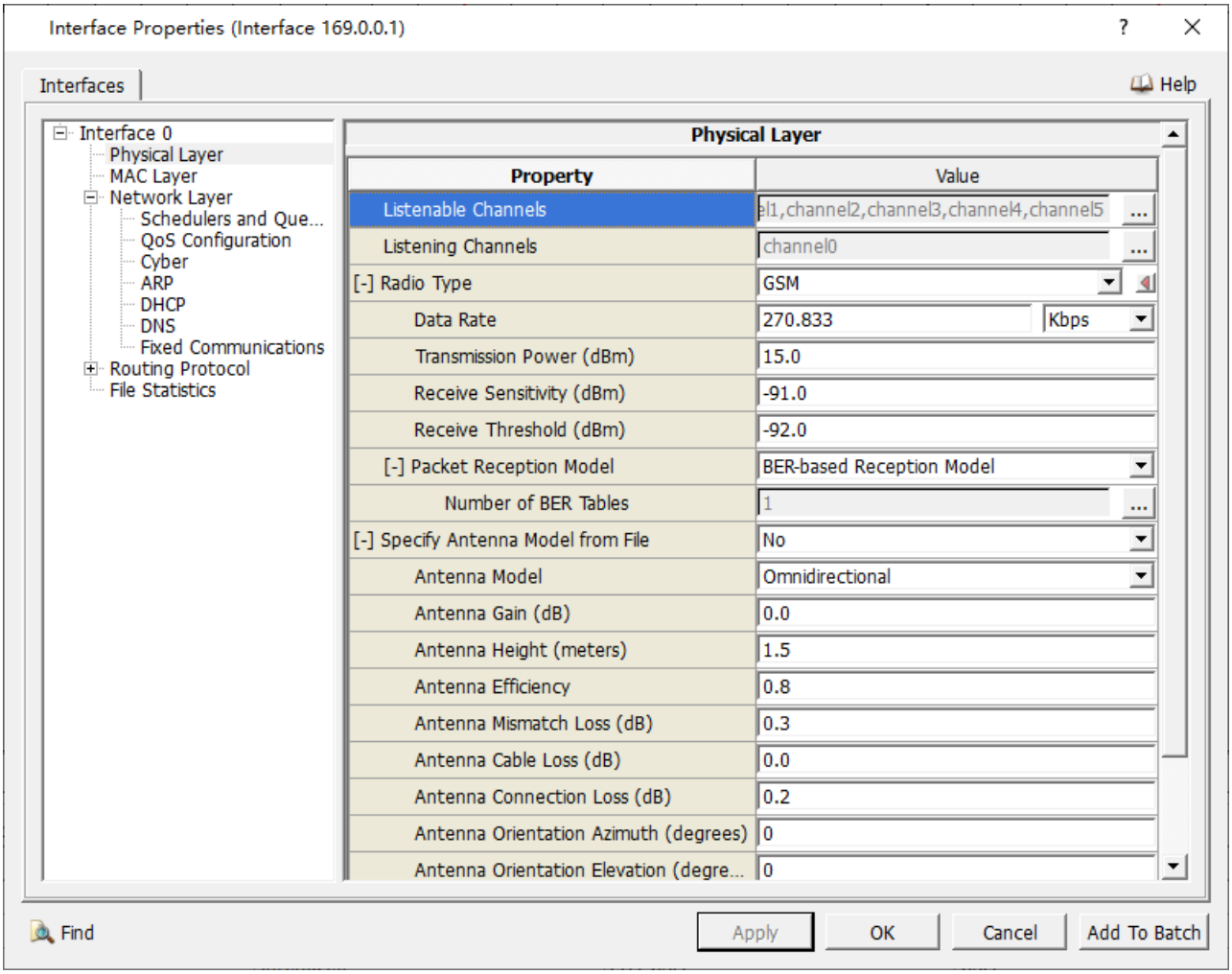
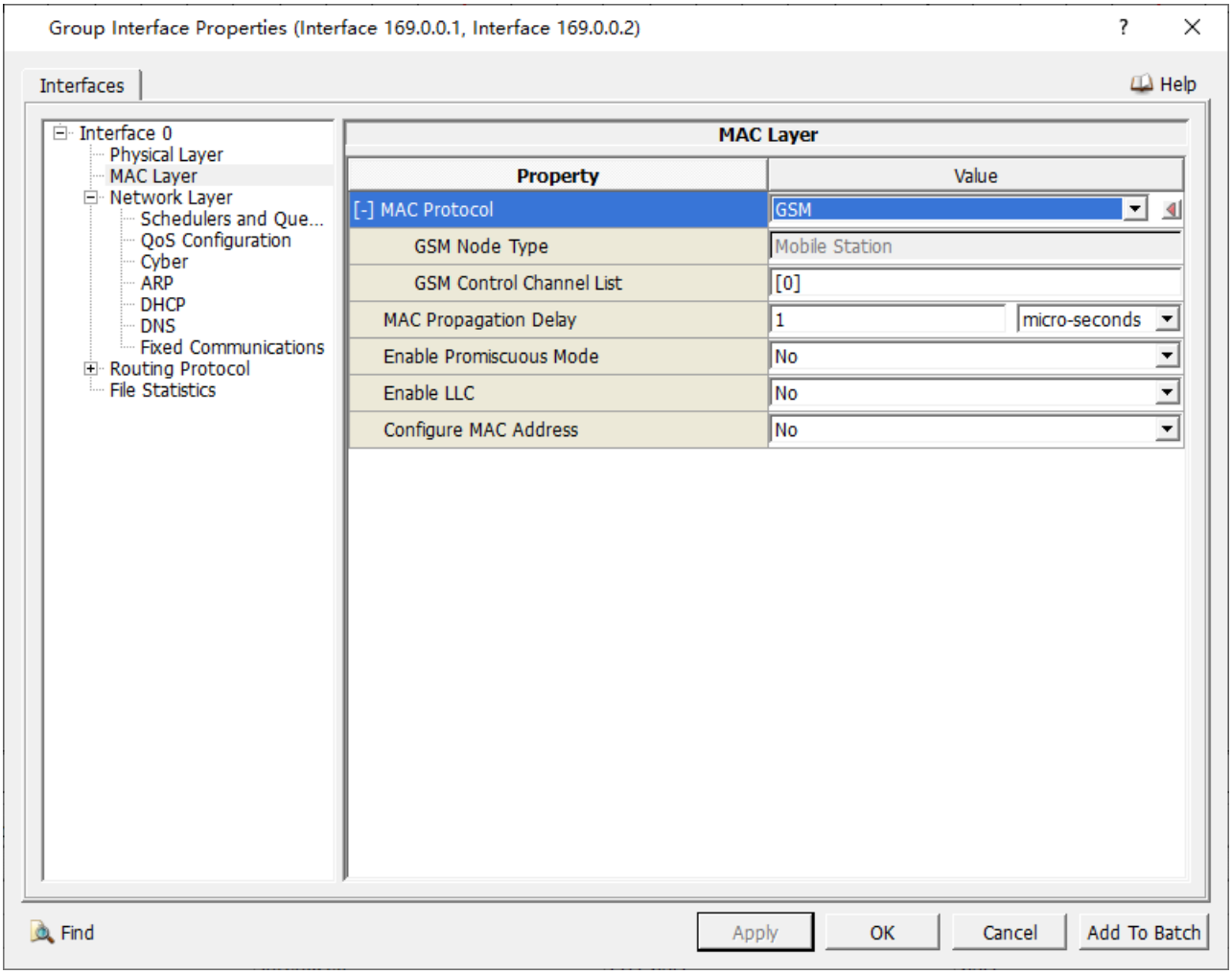
10. 设定终端接口协议栈：
    - 在Table View： Interfaces中选择两个MS的Interface0，双击打开属性框
    - 在Physical Layer的Radio Type中选择GSM



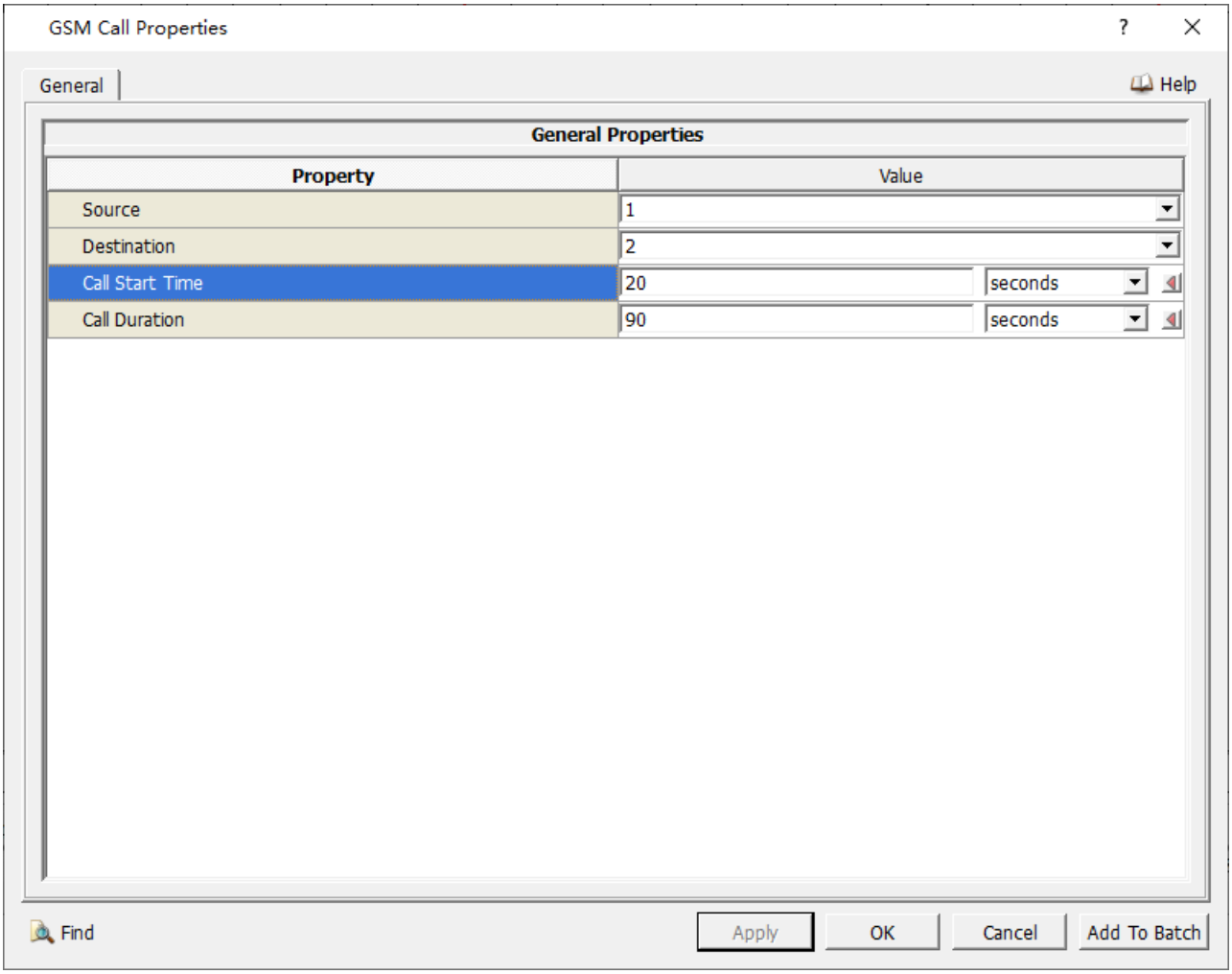
- 在Listenable Channels选择部分或全部信道，与BS的Interface配置相同



- 配置无线接口MAC层：Interface0--》MAC Layer，选MAC Protocol为GSM，确认GSM Node Type为Mobiel Station。



11. 添加应用：
    - Applications中选择GSM，从节点1到节点2添加.设置参数如下；设置Simulation Time：150s。

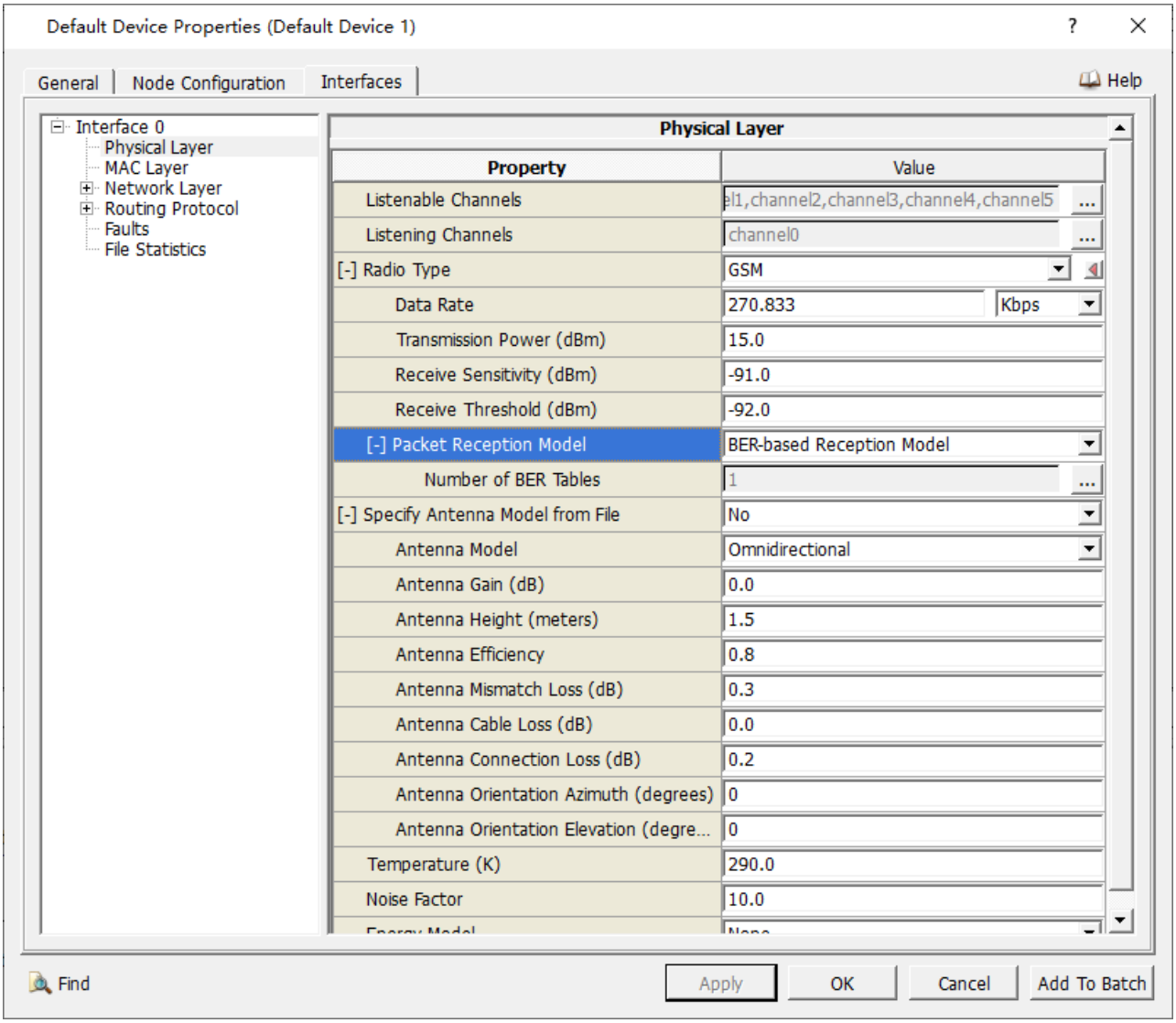


12. Run Simulation，发现错误：提示“GSM-NODE-TYPE not specified”

```
Attempting license checkout (should take less than 2 seconds) ...Loading scenario myGSM.config
Assertion (wasFound != FALSE) failed in file ..\libraries\cellular\src\mac_gsm.cpp:2411
GSM-NODE-TYPE not specified

---------- Nov 09, 2022 8:12:09 pm ----------

Launching simulator/emulator: D:/Scalable/exata/5.1/bin/exata.exe with args: myGSM.config -np 1 -interactive 127.
unknown option -emulation
EXata Developer Version 5.1
Kernel Version: 12.10
Build Number: 201310091
Build Date: Oct  9 2013, 18:55:48
EXATA_HOME = D:\Scalable\exata\5.1

Attempting license checkout (should take less than 2 seconds) ...Loading scenario myGSM.config
Assertion (wasFound != FALSE) failed in file ..\libraries\cellular\src\mac_gsm.cpp:2411
GSM-NODE-TYPE not specified
```

13. 寻找错误根源

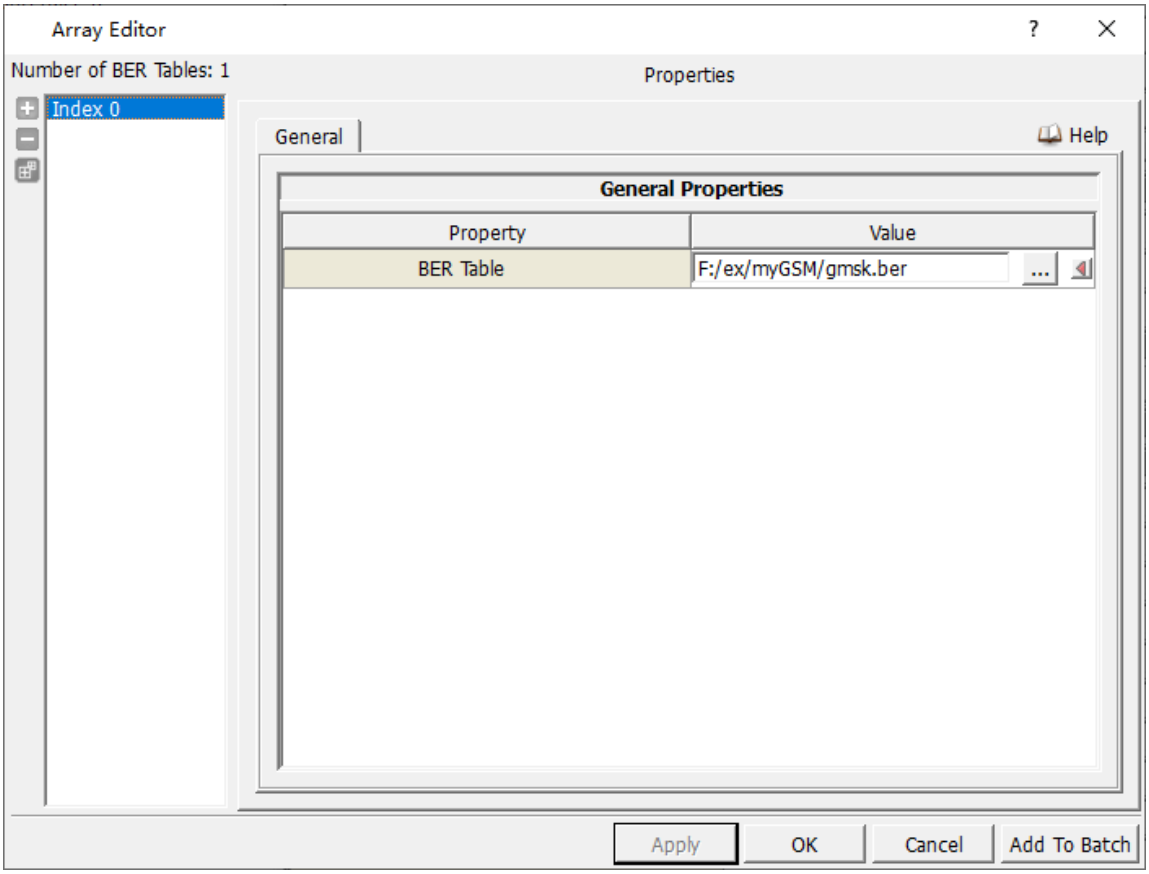
    a. 补充MS的Packet Reception Model （在Interface0的Physical Layer，默认为空）：Ber-based Recpetion Model；节点1和2都修改完后，



i. 仍有错误，但原因改变为：

```
Attempting license checkout (should take less than 2 seconds) ...Loading scenario myGSM.config
Error in file ..\libraries\wireless\src\phy.cpp:1226
PHY-RX-BER-TABLE-FILE is not specified
```

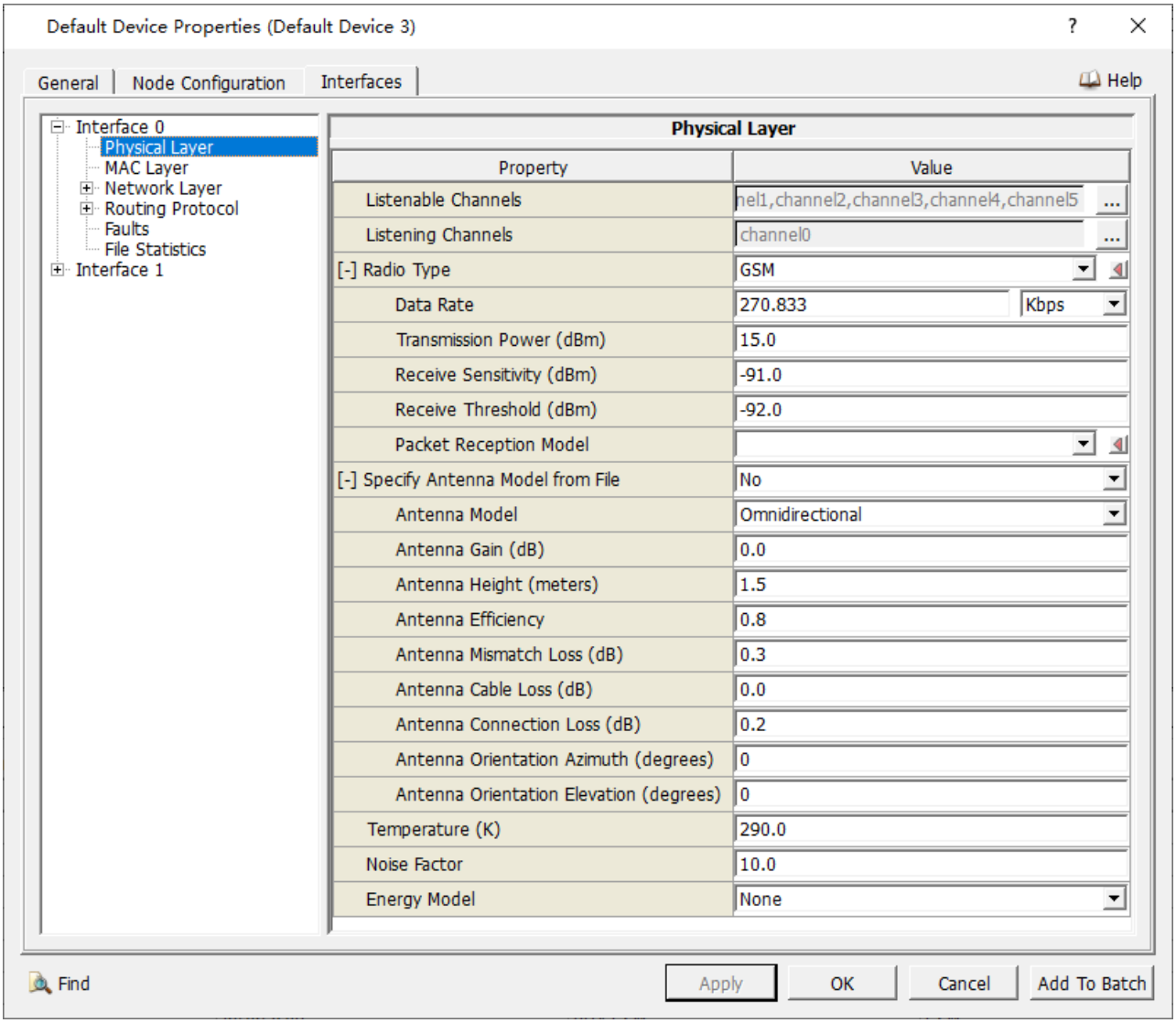
ii. 从字面理解是缺乏BER Table File，点击Number of BER Table 栏“1”后面的省略号进行选定文件，默认为空，选择与GSM/Handover场景中相同的文件，D:\Scalable\exata\5.1\data\modulation下的gmsk.ber：



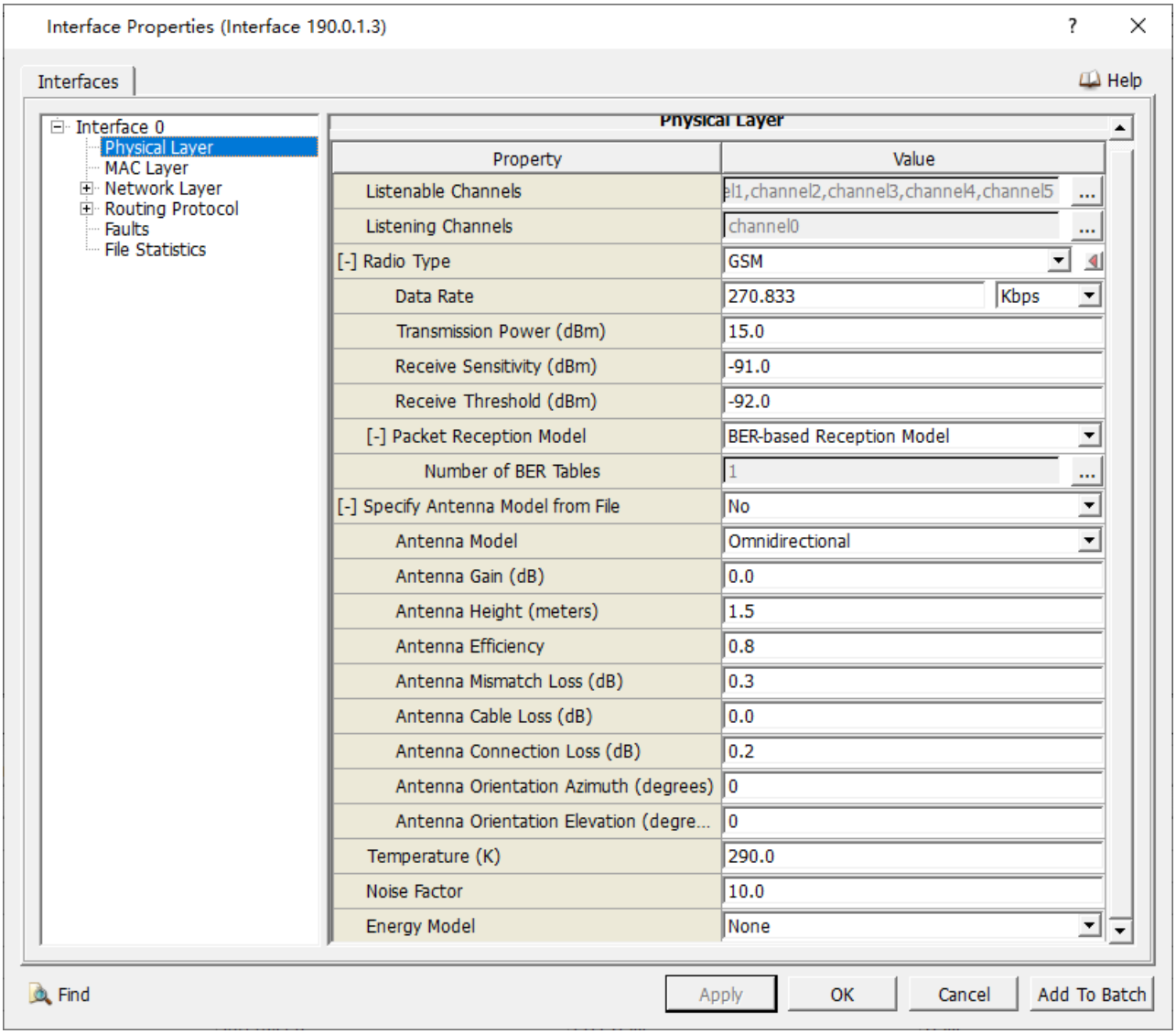
iii. 节点1和节点2的修改完后，仍有错误：【又变成了GSM-NODE-TYPE not specified!!!】

```
Assertion: Assertion (wasFound != FALSE) failed in file ..\libraries\cellular\src\mac_gsm.cpp:2411
GSM-NODE-TYPE not specified
```

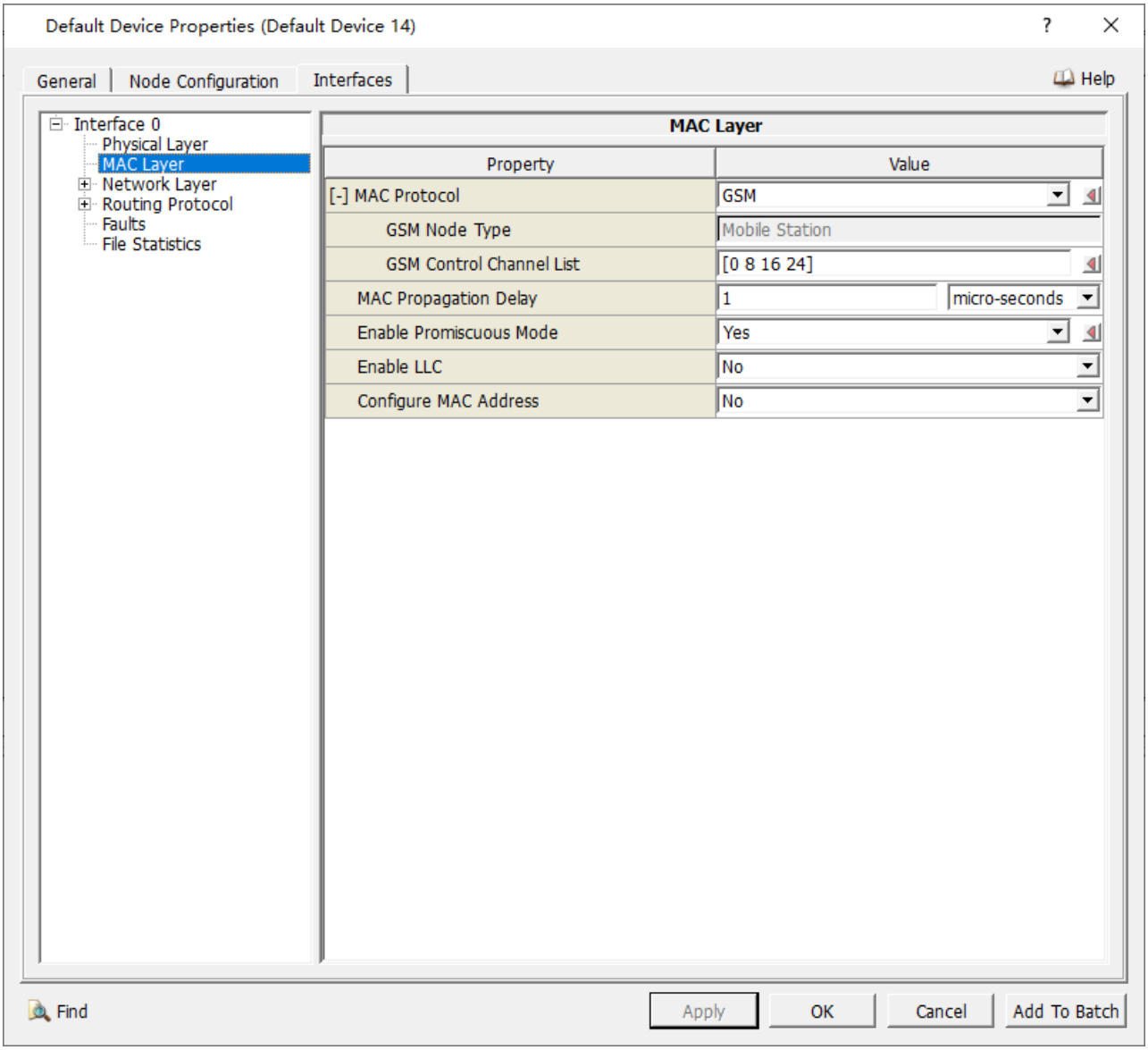
iv. 推测可能是基站测的Packet Reception Model做相同的修改：修改三个BSs的Interface0的Physical Layer--》Packet Reception Model，同上【**问题**：发现从Table View的Interface进行属性设置，跟拓扑中点节点的Interface进去居然不一样？！】从节点3的Interface进入



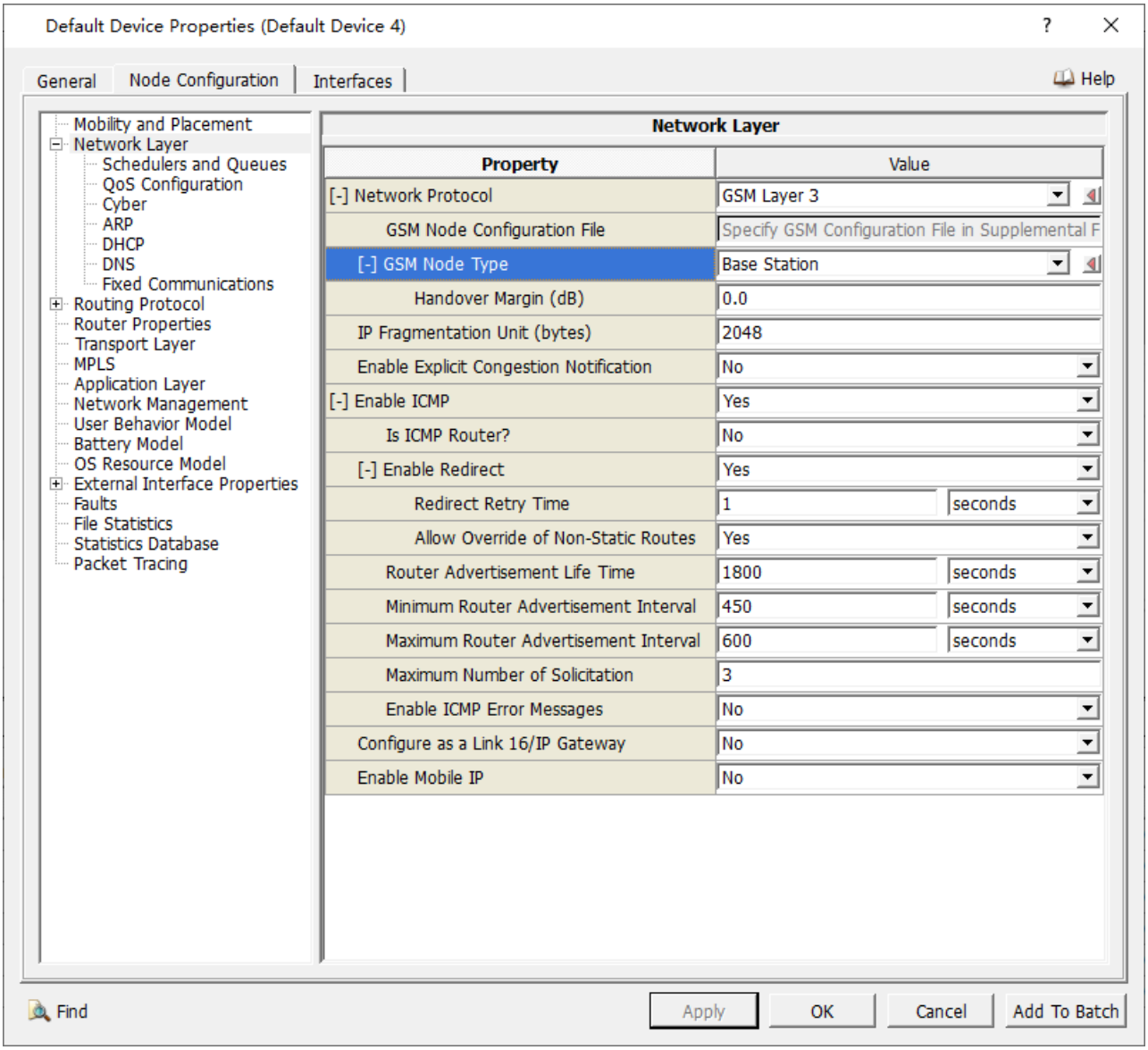
v. 从 Table View：Interfaces进入



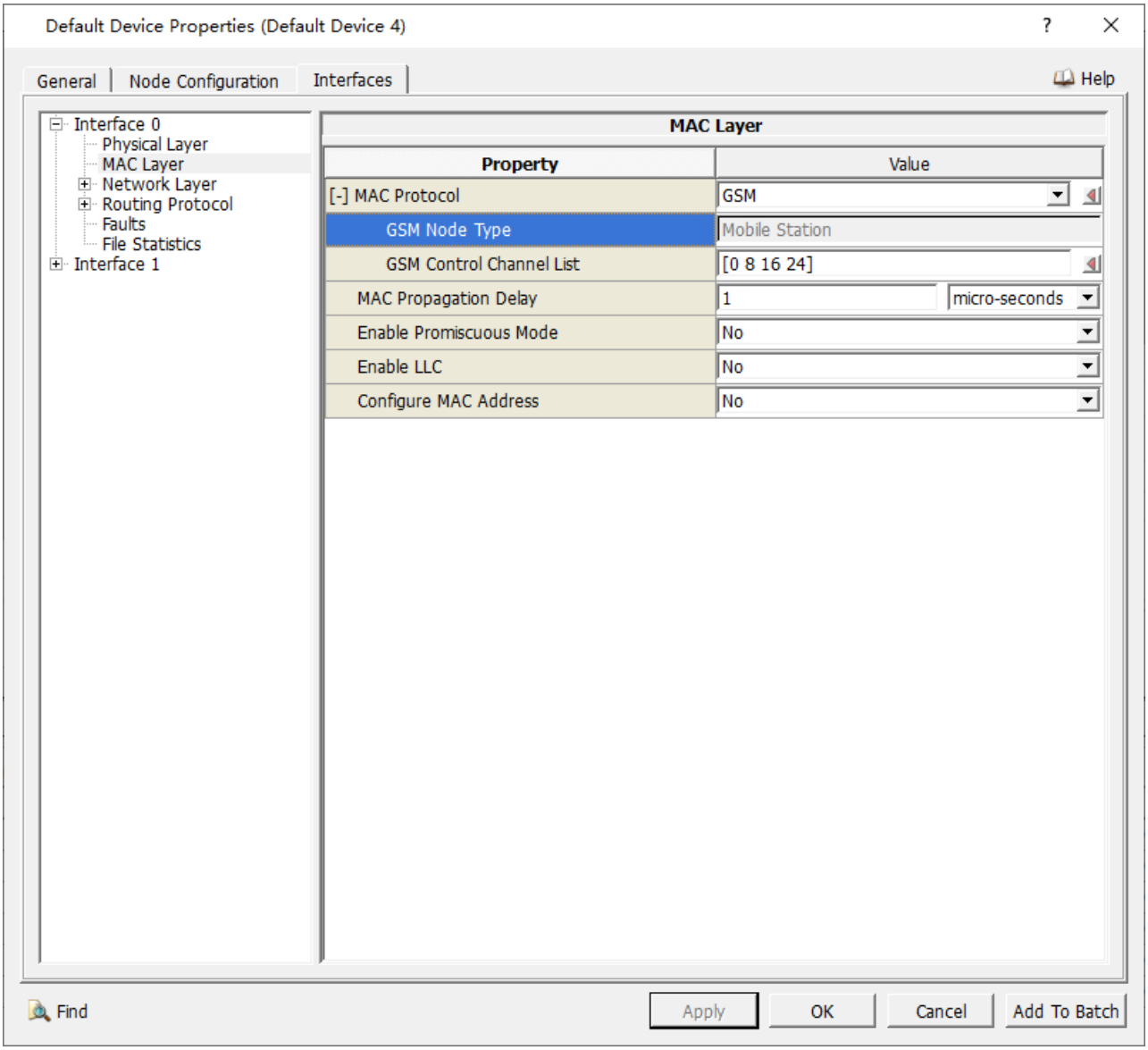
vi. GSM Control Channel List



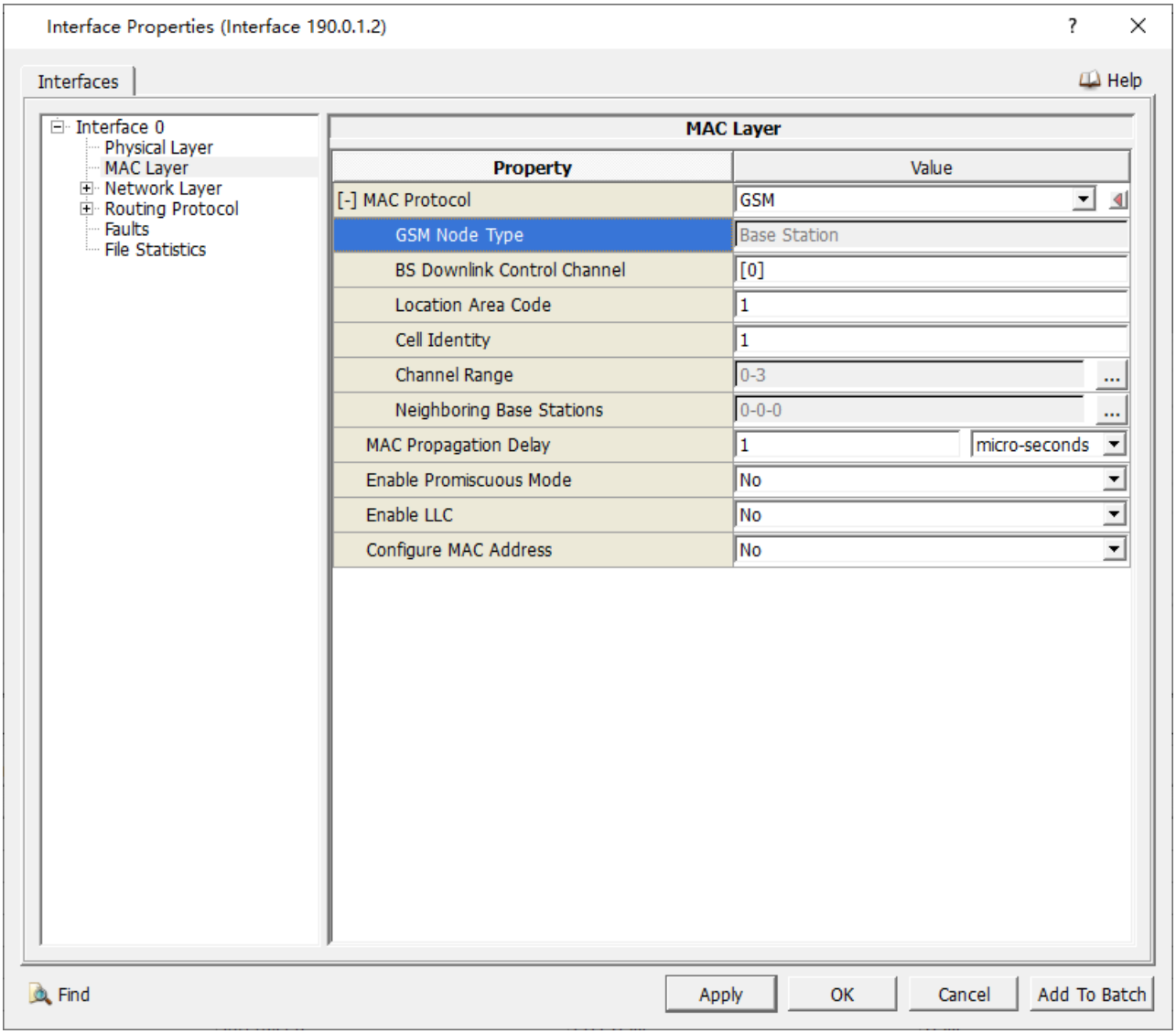
vii. 应该是找到问题了：节点4在Node Configurarion中的节点类型为BS，但在Interfaces：MAC Layer的GSM Node Type为 Base Station，二者不一致


Default Device Properties (Default Device 4)
General
Node Configuration
Interfaces
Help
Mobility and Placement
Network Layer
Schedulers and Queues
QoS Configuration
Cyber
ARP
DHCP
DNS
Fixed Communications
Routing Protocol
Router Properties
Transport Layer
MPLS
Application Layer
Network Management
User Behavior Model
Battery Model
OS Resource Model
External Interface Properties
Faults
File Statistics
Statistics Database
Packet Tracing
Network Layer
Property
Value
[-] Network Protocol
GSM Layer 3
GSM Node Configuration File
Specify GSM Configuration File in Supplemental F
[-] GSM Node Type
Base Station
Handover Margin (dB)
0.0
IP Fragmentation Unit (bytes)
2048
Enable Explicit Congestion Notification
No
[-] Enable ICMP
Yes
Is ICMP Router?
No
[-] Enable Redirect
Yes
Redirect Retry Time
1
seconds
Allow Override of Non-Static Routes
Yes
Router Advertisement Life Time
1800
seconds
Minimum Router Advertisement Interval
450
seconds
Maximum Router Advertisement Interval
600
seconds
Maximum Number of Solicitation
3
Enable ICMP Error Messages
No
Configure as a Link 16/IP Gateway
No
Enable Mobile IP
No
Find
Apply
OK
Cancel
Add To Batch

与上面不一致!

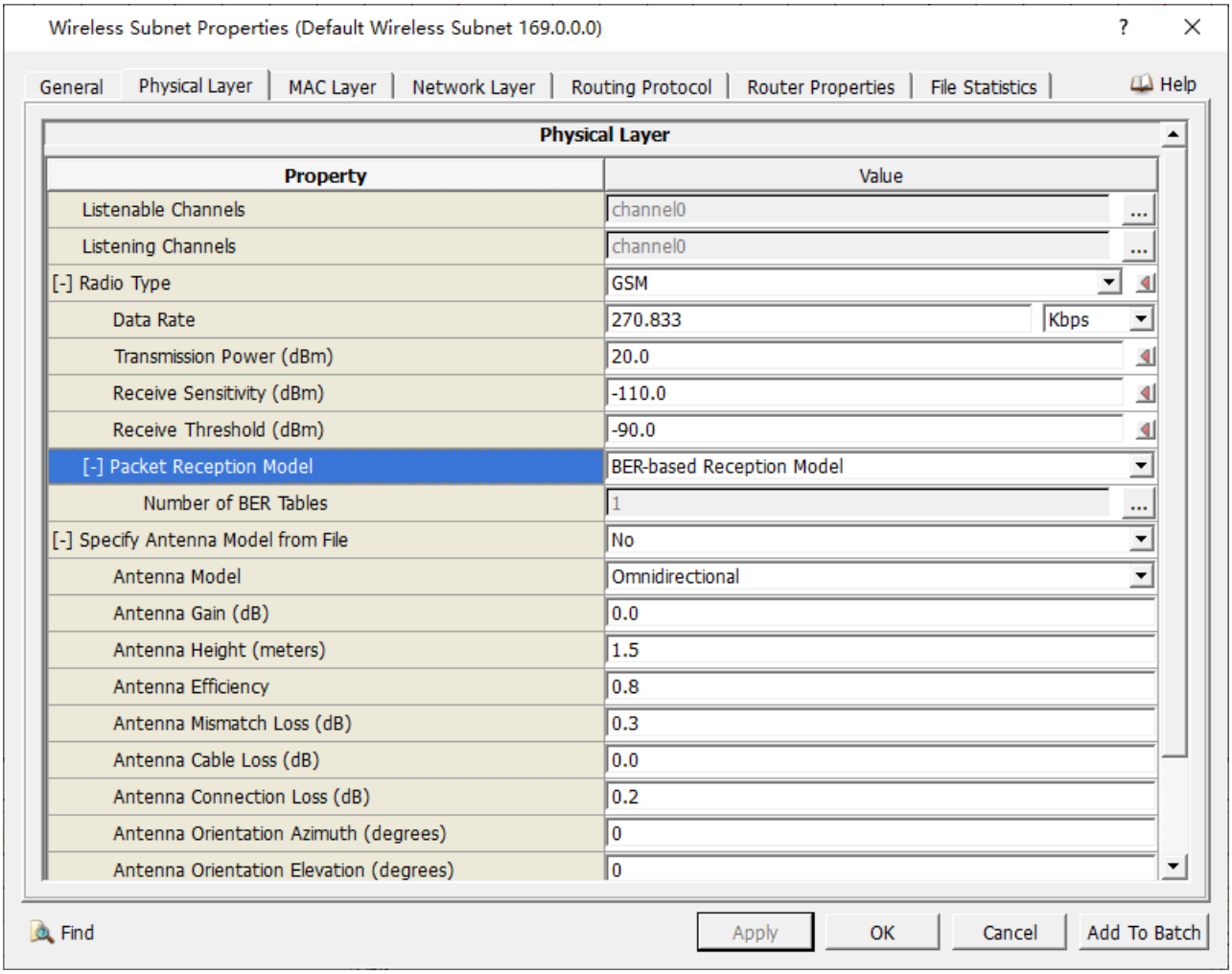


viii. 但从Table View 的 Interface0： MAC Layer进来看类型又是对的【真是晕了！】



14. 利用Notepad++对比myGSM和GSMExample两个文件，发现myGSM的 GUI和config文件不一致【不知何原因】。比如：Packet Reception Model：GUI显示为BER-based，但Config文件中却为802.11b【通过对比EXata7.0版本确定，属于软件Bug】【】

```
#********** [Default Wireless Subnet] ************************************

SUBNET N8-169.0.0.0 {1, 2} Default

#***********************Physical Layer*************************************

[ N8-169.0.0.0 ] PHY-MODEL PHY-GSM
[ N8-169.0.0.0 ] PHY-GSM-DATA-RATE 270833
[ N8-169.0.0.0 ] PHY-GSM-TX-POWER 20.0
[ N8-169.0.0.0 ] PHY-GSM-RX-SENSITIVITY -110.0
[ N8-169.0.0.0 ] PHY-GSM-RX-THRESHOLD -90.0
[ N8-169.0.0.0 ] PHY-RX-MODEL PHY802.11b
[ N8-169.0.0.0 ] DUMMY-ANTENNA-MODEL-CONFIG-FILE-SPECIFY NO
[ N8-169.0.0.0 ] ANTENNA-MODEL OMNIDIRECTIONAL
[ N8-169.0.0.0 ] ENERGY-MODEL-SPECIFICATION NONE
```



15. 但是经7.0保存后的场景文件，5.1运行会出现IP地址格式不能认的错误！无语！

```
---------- Nov 12, 2022 10:28:00 am ----------

Launching simulator/emulator: D:/Scalable/exata/5.1/bin/exata.exe with args: myGSM.config -np 1 -interactive 127.0.0.1 4001 -with-snt-gui -friendly -emula
unknown option -emulation
EXata Developer Version 5.1
Kernel Version: 12.10
Build Number: 201310091
Build Date: Oct  9 2013, 18:55:48
EXATA_HOME = D:\Scalable\exata\5.1

Attempting license checkout (should take less than 2 seconds) ...Error in file ..\kernel\src\qualnet_error.cpp:138
Bad IP address string: SUB1/1/0
```

16. 在GSM Node Congiureation之后，会生成GSM-NODE-CONFIG-FILE: myGSM.gsm，其中myGSM为场景名字。