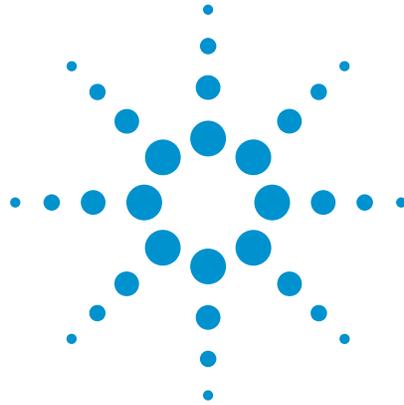


Testing Handovers Between LTE and 3G cdma2000/1xEV-DO Cellular Networks

Application Note



Agilent Technologies

Why Test Handovers Between LTE and Third Generation cdma2000/1xEV-DO Cellular Networks?

Section 1. Introduction

The global telecommunications market is witnessing a paradigm shift in demand as mobile data revenues surpass voice-based revenues in most western countries. Wireless network operators are focusing on expanding revenues in broadband services, where wireless technologies are perceived by users in the light of cable- and DSL-based broadband wired access. The rapid growth of mobile broadband is driven by demand for the latest devices, applications and services, which enable users to access any type of content on the move. This is driving up data usage on mobile networks at a tremendous rate, and operators need to respond with bandwidth availability, which in turn provides the driving force behind the development of evolved 3G and 4G systems such as 1xEV-DO revision A/B and LTE.

Long Term Evolution (LTE) is the project name given by 3GPP to the evolution of the UMTS 3G radio standards. The work on enhancing the original UMTS Terrestrial Radio Access (UTRA) continues in Release 8 of the 3GPP standards with enhancements to High Speed Packet Access (HSPA), but in addition Release 8 includes LTE, an entirely new air interface based on OFDM technology. The formal name for LTE is the Evolved UMTS Terrestrial Radio Access (E-UTRA) but it is more widely known by its project name of LTE. Offering higher data rates and lower latency for the user, a simplified all-IP network for the operator and improved spectral efficiency, E-UTRA – or LTE – promises to provide many benefits. In many cases, operators who previously delivered services using 3GPP2 network technologies – cdma2000 for data and voice and 1xEV-DO for enhanced data – have chosen LTE as their next-generation option. While this looks like a step towards a worldwide standard for the future, it gives them some immediate problems with the integration of new and legacy networks.

LTE as part of the cellular infrastructure

LTE is an all-IP system, designed primarily to provide high-speed data services. Therefore, during network build-out, and until operators choose to implement IP-based voice services, LTE networks will utilize 2G and 3G as an underlying infrastructure for voice calls, and for data services where no LTE service is yet provided. In normal operation, the mobile device (User Equipment, or UE) is required to scan for neighbor cells and generate reports which are used as a basis for cell selection and handover decisions. The processes involved are very demanding for today's UEs, which must also multi-task a large number of other applications, making heavy demands on processor power. The consequence of inadequate UE response times can be slow (or no) handover, and poor user experience such as dropped connections and frozen applications.

Industry research predicts that LTE is likely to experience its most rapid growth from 2012, when the majority of operators launch their networks and a unified approach to delivering voice communications and rich services such as video telephony over LTE become available.

Because LTE coverage will not be pervasive, testing handover capability between different radio access technologies (RAT) is critically important in the verification of UEs. For a positive end-user experience UEs need to transition smoothly between these RATs, which leads operators to increase their focus on testing the real-world performance of each device before deployment on their networks. Such performance testing goes well beyond the more traditional conformance tests defined by the industry's standards bodies.

Compliance tests are used across the development cycle for cellular products. Sensitivity, spectral and modulation quality measurements are traceable to techniques defined by industry standards bodies. The 3GPP core specifications are necessary to design an LTE UE, and conformance tests define how to measure compliance with these specifications. Organizations such as the GCF (Global Certification Forum, an active partnership among network operators) and PTCRB (originally named PCS Type Certification Review Board – for North American network operators) govern the certification process, setting standards and accrediting a global network of laboratories to undertake conformance testing. GCF and PTCRB test regimes, operator test plans, performance and interoperability test have grown dramatically with newer radio formats and more capable UEs. Equipment makers build their design verification, pre-conformance and regression test plans to enable products to move smoothly from the development lab to production in the shortest possible time.

Conformance test might be taken as an industry requirement – ensuring the UE supports a level of functionality and does not cause a problem on the system or to other users – where performance test gives the UE manufacturer the opportunity to differentiate their device based on better user experience: application speed, battery life and generally how the UE fulfills expectations. Inter-RAT handovers are part of both, and assume different importance depending on what the UE is currently doing. If it's idle (not using network resources), conformance issues are the main concern. If, however, the user has a data-hungry application active, performance issues become much more important. In idle mode, network selection decisions are made mainly by the UE, and transmitted to the network. Where the UE has an active data connection, the network will decide the transmission channel, based on its own measurements and neighbor cell measurement data returned from the UE.

A second criterion for Inter-RAT handover is the need for a voice service. Since LTE is a packet-only service, with no provision for the circuit-switched voice connection that is normal in earlier systems, making or receiving a voice call will not be part of an LTE service until standards for the support of voice are implemented. Meantime, many operators are investing in LTE alongside existing voice networks which offer more extensive coverage. In this scenario it makes sense to use the LTE connection for data and the existing network for voice.

Network evolution in the “GSM” world

For operators in much of the world, where current networks are 3GPP GSM/W-CDMA/HSPA, there's a natural evolution to LTE, and standards-based support for full backward and forward compatibility, both in the radio access network and the core network that lies behind it. The final goal is the inclusion of Voice over Internet Protocol (VoIP) as part of LTE, making it easier for operators to run IP-only networks, and full E-UTRA handover to minimize data connection disruption. In the initial network implementations, losing LTE service or making/receiving a voice call will cause an automatic fall-back to a 3G bearer, where both voice and data service can be provided. Voice service is then provided by a circuit-switched fall-back mechanism, and continuing data service managed by radio resource release and re-assignment messages. The current specifications contain fall-back scenarios all the way back to a basic GSM/GPRS connection if that is the only available network infrastructure. Release 9 includes improvements to circuit-switched fall-back to improve access speed, so there's no immediate pressure on operators to move forward with LTE voice.

Integrating LTE with “non-GSM” networks

While there is support in LTE for the discovery and measurement of neighbor 3GPP2 cdma2000/1xEV-DO cells at the air interface level, the core LTE and 3GPP2 networks have major differences. The first LTE implementations will support only “non-optimized” handovers where, when the UE loses LTE service it has to acquire 1xEV-DO service. If it has previously been connected to a local 1xEV-DO cell, this may happen relatively quickly, if not it will take much longer. In idle mode this is not really an issue, but during an active data session changing network will cause some disruption. Later implementations will support “optimized” handovers where the UE will be directed to a new serving cell and have much more information about it. To ensure the UE connects to LTE service where it is available, LTE is set as the “preferred service” by the network operator. Voice service is always supplied by a separate cdma2000 radio in the UE, and known as simultaneous voice and LTE (SVLTE); there is no integration of voice and data services, and battery power consumption is compromised. Later LTE specification releases and changes to the 3GPP2 core network will address data and voice integration, with the goal of providing the same final solution as the 3GPP case. However, there is an additional level of complexity as the solution needs to accommodate not just the transition between different physical layer technologies but also interworking between separate core networks. To support this, “tunneling” between 3GPP and 3GPP2 core networks is required. This allows the UE to perform, for instance, pre-registration on the 3GPP2 network while still connected to LTE, speeding the handover process when a cell change is required.

Section 2. So How Do You Do the Testing?

Key to developing LTE UEs for markets worldwide is the ability to test functionality under controlled, repeatable conditions. Consider these three stages: firstly, the UE must correctly interpret and properly respond to protocol messages for each network technology it supports; secondly the protocol messaging must result in the desired connection between the UE and a network; and thirdly the connection must provide the means to access the required service to the satisfaction of a user. A system such as that shown in Figure 2-1 contains the basic elements required for development testing: an environment for running the signalling conformance test scripts to validate adherence to system standards, LTE and 2/3G system emulation to provide the controlled RF environment for both UE characterization and handover testing, the ability to log and analyze protocol messaging amongst the test sets and UE, and an application server to provide the services needed for performance test.

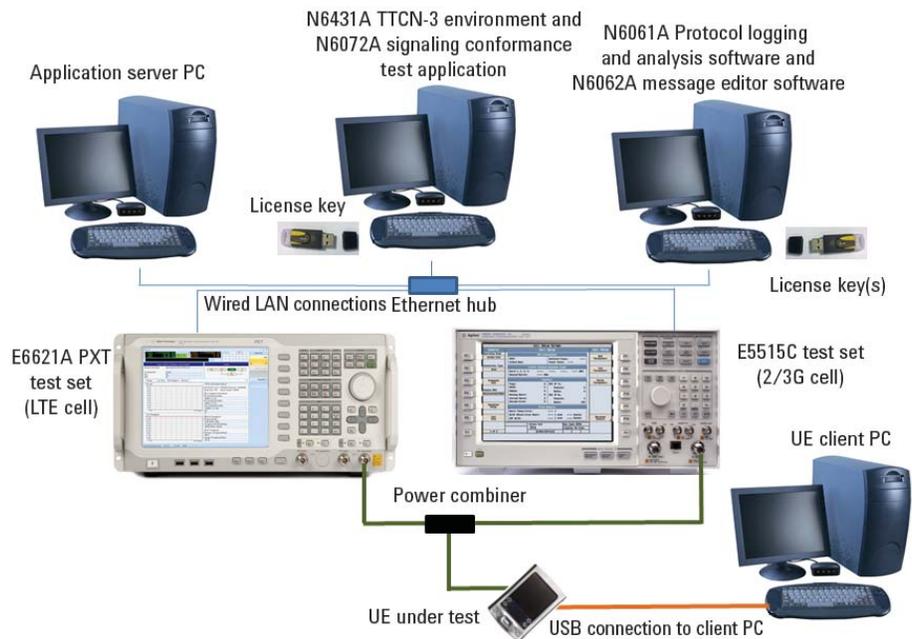


Figure 2-1. System for UE characterization using Agilent Wireless Communications Test Sets

More comprehensive systems can be used to provide a more complex RF environment for testing – for example additional test sets to provide multiple neighbor cells and both 2G and 3G cells of different technologies, and adding fading simulators to provide a better representation of a true mobile environment.

Signalling conformance test (sometimes called protocol conformance test) uses scripts describing specific test cases and provided by accredited standards organizations, and is the basis for proving interoperability. The device must pass the required cases for each technology that it supports. The TTCN- 3 (Test and Testing Control Notation version 3) Environment shown in the figure provides a graphic user interface and software test framework. The tool enables TTCN- 3 test cases to be loaded, edited or created, compiled and executed. It includes logging functions and the ability to automate sequences of tests or campaigns.

To enable test case portability from one test platform to another, the functions available to a TTCN-3 programmer through the TRI (TTCN-3 Run Time Interface) have been standardized by ETSI. Manufacturers provide the standard TTCN-3 compiled test cases and an adaptor that connects the standardized TRI interface available to programmers to the unique characteristics of their test instrumentation. This testing is typically done under good RF conditions, and the goal is to demonstrate that the UE responds correctly during a sequence of protocol messages. Pass/fail is determined from the messages and their content – no parametric measurements are made.

In the RF domain, a test system which can provide cell emulation for different technologies, including parametric changes and corresponding measurements, can be used to investigate both the outcome and the timing of inter-RAT handovers. 3GPP standards cover expected Radio Resource Management (RRM) behavior between LTE and earlier releases. In the case of operators moving to LTE from 3GPP2 technologies (cdma2000/1xEV-DO) operators are creating their own requirements and test plans for handover testing, and working with suppliers to ensure new UEs meet the needs of their customers. This type of testing helps UE developers ensure their devices conform to the latest needs of network operators as the various inter-RAT scenarios are fully specified and implemented. Table 3-1 lists example tests that might be specified for Inter-RAT testing.

When the ability to change the RF environment is used in conjunction with a live application server, it can provide valuable insight into the behavior of both application and UE behavior during disruptions caused by changes in the RF channel: for example, RF channel conditions, system handovers, dropped calls, connection speed changes, and interference from other applications.

1xEV-DO and LTE systems can provide multiple simultaneous connections. The application server can also be used to ensure the UE handles multiple processes correctly and in a timely way. Examples might include delivering an SMS during video streaming, downloading multiple files and using an interactive gaming application. This capability gives the developer the view of overall device or application performance that helps differentiate their product from its competitors.

Section 3. So Give Me an Example LTE/3GPP2 Partial Handover Test Plan and Show Me a Test

As part of the validation of a new UE, a series of tests of handover capability must be carried out. Intra-technology handover conformance tests are already specified for both LTE and 3GPP2, but operators are specifying their own test plans for handovers between LTE and cdma2000/1xEV-DO. The following table shows some of the test conditions that might be included in such a test plan.

Cell selection using GMSS procedures due to LTE system lost	Cell selection due to LTE system lost: previous session on target eHRPD, UE context maintenance timer in high speed gateway running
	Cell selection due to LTE system lost: previous session on target eHRPD, UE context maintenance timer in high speed gateway running and session transfer available
	Cell selection to eHRDP cell 2 due to LTE system lost: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway running and session transfer not available
	Cell selection due to LTE system lost: previous session on target eHRPD, UE context maintenance timer in high speed gateway expired
	Cell selection due to LTE system lost: previous session on target eHRPD, UE context maintenance timer in high speed gateway expired and session transfer available
	Cell selection to eHRDP cell 2 due to LTE system lost: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway expired and session transfer not available
	Cell selection due to LTE system lost: no previous session on eHRPD
Cell selection based on reselection procedures	Cell reselection: previous session on target eHRPD, UE context maintenance timer in high speed gateway running
	Cell reselection: previous session on target eHRPD, UE context maintenance timer in high speed gateway running and session transfer available
	Cell reselection to eHRDP cell 2: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway running and session transfer not available
	Cell reselection: previous session on target eHRPD, UE context maintenance timer in high speed gateway expired
	Cell reselection to eHRDP cell 2: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway expired and session transfer available
	Cell reselection to eHRDP cell 2: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway expired and session transfer not available
	Cell reselection: no previous session on eHRPD
LTE Idle to 1xRTT/HRPD idle	Cell selection due to LTE system lost: 1xRTT
	Cell selection due to LTE system lost: 1xRTT/HRPD
RRC release with MEAS gaps scheduled	RRC Release with Redirection and measurement gaps scheduled: previous session on target eHRPD, UE context maintenance timer in high speed gateway running
	RRC Release with Redirection and measurement gaps scheduled: previous session on target eHRPD, UE context maintenance timer in high speed gateway running and session transfer available
	RRC Release with Redirection to eHRDP cell 2 and measurement gaps scheduled: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway running and session transfer not available
	RRC Release with Redirection and measurement gaps scheduled: previous session on target eHRPD, UE context maintenance timer in high speed gateway expired
	RRC Release with Redirection to eHRDP cell 2 and measurement gaps scheduled: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway expired and session transfer available
	RRC Release with Redirection to eHRDP cell 2 and measurement gaps scheduled: previous session on eHRPD cell 1, UE context maintenance timer in high speed gateway expired and session transfer not available
	RRC Release with Redirection and measurement gaps scheduled : no previous session on eHRPD

Example test details

The following procedure describes a handover test in detail. The UE is first registered to a 1xEV-DO cell, then set up on an LTE cell and handed back and forward between it and the 1xEV-DO cell. The system setup is shown in Figure 3-1.

In order to run the test, you will need a test SIM configured for inter-RAT handovers between LTE and 1xEV-DO, as specified by the network operator concerned, and a matching scenario file for the PXT. One supplier of such SIMs is Gemalto (www.gemalto.com). An example scenario file is included in Appendix 1 of this Note.

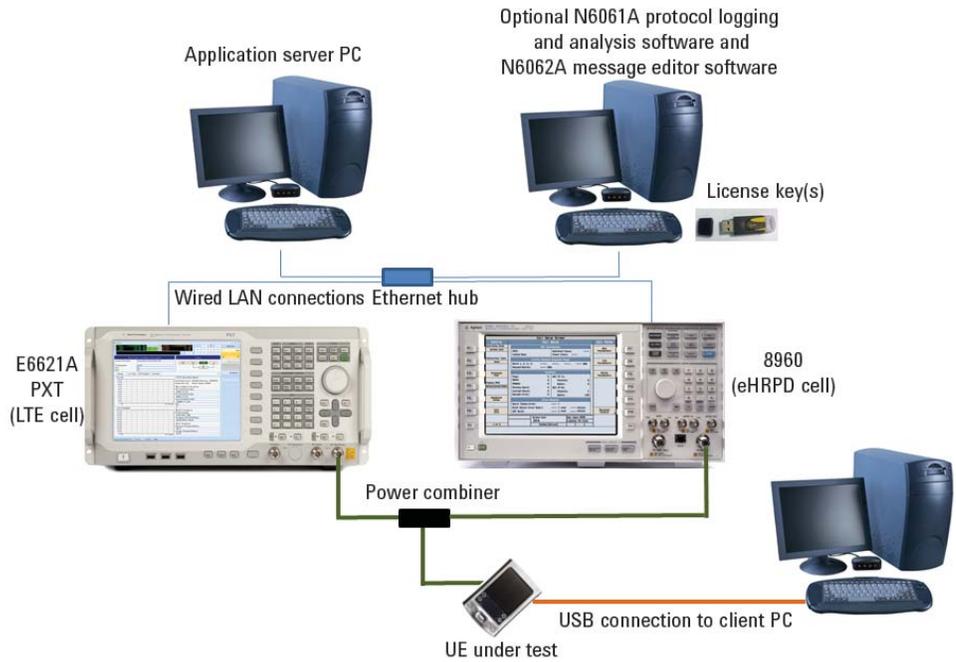


Figure 3-1. System setup for handover testing.

Before following the test procedure, the 8960 and PXT must be pre-configured. The settings are listed below, and can be saved to a register for further use. The naming convention used to describe instrument setup is as follows:

[Key name] represents a hard key on the instrument front panel

{Key name} represents a menu key displayed on the instrument screen

Presetting the instruments

Both the E6621A and the 8960 should be in their 'preset' states before executing each test case.

PXT (LTE Cell)
Select [**Preset**] -> {Preset}

8960 (eHRPD Cell)
Select [**Shift**] -> [**Preset**]

LAN IP Addresses

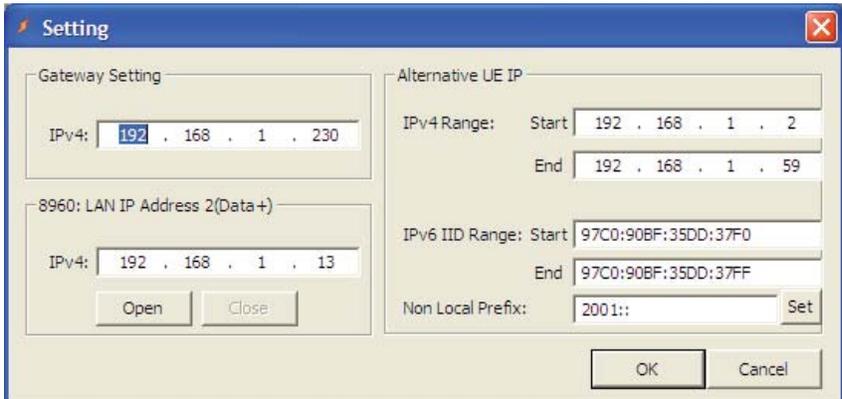
Set the IP addresses of the PXT, 8960, EPC and server PC as follows:

Table 1. System IP addresses

	IP address	Mask	Gateway
PXT	192.168.1.60	255.255.255.0	192.168.1.230
8960		255.255.255.0	192.168.1.230
IP 1	192.168.1.13		
IP 2	192.168.1.14		
UE 1	192.168.1.51		
UE 2	192.168.1.52		
UE 3	192.168.1.53		
EPC	See below		
Server PC	192.168.1.230	255.255.255.0	192.168.1.60
UE Client PC (by DHCP)	192.168.1.51	255.255.255.0	

Pre-test setup

Ensure the latest version of the EPC application is running on the PXT. Using a USB mouse, minimize the E6621A application, right click on the EPC icon (lightning bolt) in the system tray and select 'Exit'. To launch the latest version, click **start**, **Run...**, **Browse...**, navigate to **D:\Program Files\Agilent\E6621A\Tools\eepc.exe** and click **OK**. Right click on the EPC icon and select "Setting". Using the front panel numeric keys or a USB keyboard, set the IP addresses as shown below.



PXT (LTE cell)

- Load Register 1 [**Recall**] {Recall State} {Register 1}
- Turn off [**RF1**] and [**RF2**]

If Register 1 has not already been saved, the following setup needs to be done:

Create the required scenario file using the instructions in Appendix 1. Using a USB mouse, minimize the E6621A application and copy the scenario file onto the PXT from the USB memory stick to the Windows directory **D:\Program Files\Agilent\E6621A\LTE-Scenario**

Set the PXT as follows:

Select [**Mode Setup**] -> {**EPC**} -> {**Embed**}
Select [**Freq**] -> {**Center (DL)**} -> [751] -> {**MHz**}
Select [**Freq**] -> {**Center (UL)**} -> [782] -> {**MHz**}
Select [**Amp**] -> {**RF1 Amplitude**} -> [-31] -> {**dBm**}
Select [**Amp**] -> {**RF2 Amplitude**} -> [-31] -> {**dBm**}
Select [**Atten**] -> {**RF1 Ref Level**} -> [-43] -> {**dBm**}
Select [**Mode Setup**] -> [More (2/2)] -> {**PHY Settings**} ->
{**UL Resource Allocation**} -> {**I_MCS**} -> [5] -> {**Enter**}
Select [**Mode Setup**] -> [More (2/2)] -> {**PHY Settings**} ->
{**UL Resource Allocation**} -> {**RB Size**} -> [20]->{**Enter**}
Select [**Mode Setup**] -> [More (2/2)] -> {**Security**} -> {**Off**}
Select [**Mode Setup**] -> {**Call Scenario**} scroll to required filename {**Load**}

Save for future use:

Select [**Save**] -> {**Save State**} -> {**Register 1**}

The saved state includes the above settings, including the scenario file information.

8960 (eHRPD cell)

Ensure the 1xEV-DO Lab App is selected: [**SYSTEM CONFIG**] -> {Format Switch [F2]} -> IS-856

Ensure the external EPC is disconnected: [**LH Menu, MORE**] -> {2 of 3} -> {eUTRAN/eHRPD Interworking Info [F6]} -> {Disconnect from External EPC [F2]}

Setup the IP addresses: [**SYSTEM CONFIG**] -> {Instrument Setup [F1]}

LAN IP Address	}
Subnet Mask	} see Table 1
Default Gateway	}
LAN IP Address 2 (Data+)	}

Set the PDN IP –

[**CALL SETUP**] -> [**LH Menu, MORE**] -> {3 of 3} -> {Data Channel Info [F2]} ->
[**LH Menu, MORE**] -> {2 of 2} -> {IP Addressing Info [F5]} -> {DUT IP Setup [F2]}
DUT IP Address } see Table 1
DUT IP Address 2 }

Setup the EPC IP: [CALL SETUP] -> [LHMenu, MORE] -> {2 of 3} -> {E-UTRAN/eHRPD Interworking Info [F6]} -> {Ext EPC IP Addr [F1]} see Table 1

Set up the eHRPD parameters: [CALL SETUP] -> [RHMenu, MORE] -> {2 of 3} -> {Protocol Rel [F11]} -> A (1xEV-DO-A)

Select [CALL SETUP] -> [RHMenu, MORE] -> {1 of 3} -> {Application Config [F10]} -> {Session Application Type (Press knob for options)} -> Alternate EMPA

Select [CALL SETUP] -> [RHMenu, MORE] -> {1 of 3} -> {Cell Power [F7]} -> [-35] -> [ENTER]
{Cell Band} -> US PCS -> [ENTER], {Channel} -> [375] -> [ENTER]

Set the Session Close Timeout to 100 minutes: [CALL SETUP] -> [RHMenu, MORE] -> {3 of 3} -> {Session Close} -> [100] -> [ENTER]

Setup the Preferred Control Channel Cycle Control: [CALL SETUP] -> [LHMenu, MORE] -> {2 of 3} -> {Access Network Info [F2]} -> {Configurable Attributes Info [F1]} -> {Configurable Attribute Parms [F1]} -> {Preferred Control Channel Cycle Control} -> *press knob for options* -> AT Specified -> [ENTER]

Set the Sector ID to '00800580000000000000000000000000' and the Color Code to 26:

Call Setup -> [CALL SETUP] -> [LHMenu, MORE] -> {2 of 3} -> {Access Network Info [F2]} -> {Cell Parameters [F2]} -> Sector ID, Upper (Hex) -> [00800580] -> [ENTER]
Sector ID, Upper Middle (Hex) -> [00000000] -> [ENTER]
Sector ID, Lower Middle (Hex) -> [00000000] -> [ENTER]
Sector ID, Lower (Hex) -> [00000000] -> [ENTER]
Color Code -> [26] -> [ENTER]

Set Authentication: [CALL SETUP] -> [LHMenu, MORE] -> {3 of 3} -> {Data Channel Info [F2]} -> [LHMenu, MORE] -> {2 of 2} -> {EAP-AKA' Auth Info [F1]} -> {Authentication Parameters [F1]}
Authentication State }
Authentication Key (K) (Hex) } Set to match your SIM
Operator Variant Parameter Type }
Operator Variant Parameter Value (Hex) -> [E8ED289DEBA952E4283B54E88E6183CA] -> [ENTER]
Randon (RAND) Value (Hex) -> [01234567890123456789012345678900] -> [ENTER]
Authentication Management Field (AMF) (Hex) -> [B9B9] -> [ENTER]

Save in Register 1 for future recall: [SAVE] -> {Save Register 1} -> [ENTER]

Setup the PXT

Recall Register 1	Press [Recall] , {Recall State} -> {Register 1}
Check Scenario file	Under Measurement/Function select [Mode Setup] . Under "Base Station Emulator Information", check the A-Cell Scenario File Name matches the file you created and loaded.

Setup the EPC

Check the EPC address settings	Open the EPC and edit the addresses. Minimize the E6621A application and right click on the EPC running in the icon tray, select 'Settings'.
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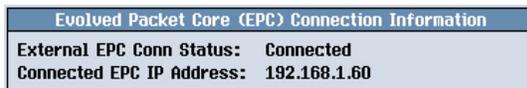
Save any changes – press OK
Right click and 'Exit' the application
Reopen the application for the changes to take effect.

Setup the 8960

Select Format	Press [SYSTEM CONFIG] -> {Format Switch [F2]} -> IS-856 -> [ENTER]
Recall Register 1	Recall Register 1 (data previously saved as above): [Recall Register] -> {Recall Register 1} -> [ENTER]
Set External EPC IP	Press [CALL SETUP] -> [LHMenu, MORE] -> {2 of 3} -> {E-UTRAN/eHRPD Interworking Info [F6]} -> {Ext EPC IP Addr [F1]} -> 192.168.1.60 -> [ENTER]

Perform handover

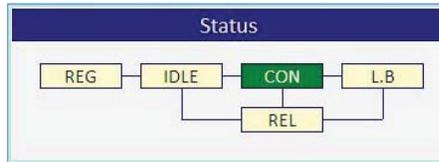
PXT: Run Scenario file	Under Display select [BSE] . Under Measurement/Function select [Mode] . Using the soft keys select {Emulator Mode} -> [Run]
8960: Idle State	Press [CALL SETUP] -> {Close Session [F4]} to reset to Idle.
8960: Connect to the external EPC	Press [CALL SETUP] -> [LHMenu, MORE] -> {2 of 3} -> {E-UTRAN/eHRPD Interworking Info [F6]} -> {Connect to external EPC [F2]} Ensure the 8960 external Connection Status is now connected.



8960: Cell Off	Press [CALL SETUP] -> [RHMenu, MORE] -> {1 of 3} -> {Cell Power [F1]} -> [OFF]
Client PC:	Connect the device to the USB port Open the Client Device Manager and wait for it to find the LTE cell.
Client PC:	Connect to the PXT and observe the CON state. Click Connect WWAN



PXT: Observe: EPC (Evolved Packet Core) is now active EPC and the UE is connected



Server PC: Start a PING session with the UE/Client PC
Open a cmd prompt and send **ping -t 192.168.1.51**

NOTE: You may need to disable Windows Firewall in both the server and UE/Client PCs to prevent it blocking the communication between them.

```

C:\Users\Agilent_MBO_PCI>ping -t 192.168.1.51

Pinging 192.168.1.51 with 32 bytes of data:
Reply from 192.168.1.51: bytes=32 time=36ms TTL=128
Reply from 192.168.1.51: bytes=32 time=33ms TTL=128
Reply from 192.168.1.51: bytes=32 time=30ms TTL=128
  
```

8960: Cell On Press [CALL SETUP] -> [RHMenu, MORE] -> {1 of 3} -> {Cell Power [F1]} -> [ON]

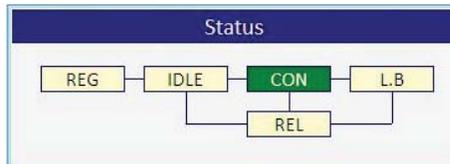
PXT: Perform a RRC Connection Release Under Display select [BSE]. Under Measurement/Function select [Func]. Using the soft keys select {UE Detach} -> {Message Name} -> {RRCCConnectionRelease} -> {Send}

8960: Observe handover The UE should now be connected to the 8960, whilst the PXT is in idle mode



8960: Perform handover Press [CALL SETUP] -> [RHMenu, MORE] -> {1 of 3} -> {Cell Power [F1]} -> [OFF]

PXT: Observe handover The UE should now be connected to the PXT

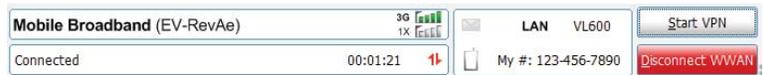


Server PC: Observe the data connectivity whilst performing handover

Annotations on the right side of the screenshot:

- Connected to LTE BSE
- LTE to eHRPD Handover
- Connected to eHRPD BSE
- eHRPD to LTE Handover
- Connected to LTE BSE

Client PC: Disconnect WWAN Session



Appendix 1 – Create and store PXT Scenario File

The PXT requires scenario files that provide it with details of the LTE environment and various instrument parameters. The files use the extension “.lbmf” and reside in a specific directory on the PXT. The basic file needed for the example in this note is listed on the next page; simply copy the text below into a new file using notepad and check it has no additional characters (eg “Page Number xx”). When you are sure it is correct, save it with the correct file extension and note the name. Using N6062A message editor, make the changes required to match your test SIM and save them. When you are satisfied that the SIM and scenario file match, copy it to a USB memory stick for installing in the PXT.

[LTEMMSG]
Description=BasicLTEBSEMessage
Version=2009-03

[RRCMSG]
MIB=BCCCH-BCH-Message,690C43
SIB1=BCCCH-DL-SCH-Message,404C469010102000FF0B844C0808104B40
SIB2=BCCCH-DL-SCH-Message,00800C623F008000C00270000000000029AA55496D044B57C0E10C0040300
RRCConnectionSetup=DL-CCCH-Message,60129B3E820F635EF259B0C000010480A0
DL_Auth=DL-DCCH-Message,0801203A900B924EB0F2E575CDCEE6FD52E8232BBA98811AA9E5F4B1BD44E90C57326D723DF9A8
DL_sec_command=DL-DCCH-Message,0800383AE80388170700
SecurityModeCommand=DL-DCCH-Message,300000
UEcapEnquiry=DL-DCCH-Message,380000
RRCReconfiguration=DL-DCCH-Message,2016108000100A3730F460002313800000000083A1008783200980C2008100122900E08482800000000000000701B0B83702BB3D34B6
B981B1B7B68280E0540099AC192805FB0980C2009180D55DE6000BA7B4381A93B80327A03EA05B1C419AA81C
RRCConnectionRelease=DL-DCCH-Message,2820809DB0
DetachAccept=DL-DCCH-Message,0800413800000000103A30
SIB8=BCCCH-DL-SCH-Message,0019C000000000AE0000408290380103B6BA8D86E1A0D870500
Redirect=DL-DCCH-Message,282080C970
RRCReconfigA2MeasId1=DL-DCCH-Message,201005800004C81002E000008C00
RRCReconfigB2MeasId2=DL-DCCH-Message,20103F800000B2A09DB78000C000018994A000120000108420
RRCReconfigA2MeasId3=DL-DCCH-Message,201005000404C81002E01004
RRCReconfAGILENT1=DL-DCCH-Message,200601413800000000C901608482800000000000000605AB2D2BA47A22A92722AA0280E054009A2C191407E44A2388B35589C
RRCReconfAGILENT2=DL-DCCH-Message,200601293800000000B901E08482800000000000004843B3D3B0B236B4B70280E054009AAC191407D2A2388B35589C
DLInformation_ESMBearDeactivate=DL-DCCH-Message,0800513800000000B90266920
DLInfo_AGILENTReject=DL-DCCH-Message,08205138000000008101688D8
RRCReconfigurationTAUAccept=DL-DCCH-Message,201600000493800000000083A480B4381A93B80327A03EA05B1C419AA81C

[TYPE]
MIB=MasterInformationBlockType
SIB1=SystemInformationBlockType
SIB2=SystemInformationBlockType
RRCConnectionSetup=rrcConnectionSetup
DL_Auth=dllInformationTransfer
DL_sec_command=dllInformationTransfer
SecurityModeCommand=securityModeCommand
UEcapEnquiry=ueCapabilityEnquiry
RRCReconfiguration=rrcConnectionReconfiguration
RRCConnectionRelease=rrcConnectionRelease
DetachAccept=dllInformationTransfer
SIB8=SystemInformationBlockType
Redirect=rrcConnectionRelease
RRCReconfigA2MeasId1=rrcConnectionReconfiguration
RRCReconfigB2MeasId2=rrcConnectionReconfiguration
RRCReconfigA2MeasId3=rrcConnectionReconfiguration
RRCReconfAGILENT1=rrcConnectionReconfiguration
RRCReconfAGILENT2=rrcConnectionReconfiguration
DLInformation_ESMBearDeactivate=dllInformationTransfer
DLInfo_AGILENTReject=dllInformationTransfer
RRCReconfigurationTAUAccept=rrcConnectionReconfiguration

[SCENARIO]
MIB=MIB
SIB_1=SIB1
SIB_2=SIB2
SIB_3=SIB8

[RRC_CONNECTION]
rrcConnectionRequest__=RRCConnectionSetup
rrcConnectionSetupComplete_ATTACHREQUEST=RRCReconfiguration
ullInformationTransfer_DETACHREQUEST=DetachAccept
measurementReport_measId1=RRCReconfigB2MeasId2
measurementReport_measId2=Redirect
measurementReport_measId3=Redirect
ullInformationTransfer_PDNCCONNECTIVITYREQUEST_AGILENT2=DLInfo_AGILENTReject
ullInformationTransfer_PDNCCONNECTIVITYREQUEST_AGILENT1=RRCReconfAGILENT1
ullInformationTransfer_PDNDISCONNECTREQUEST=DLInformation_ESMBearDeactivate
rrcConnectionSetupComplete_TRACKINGAREAUPDATEREQUEST=RRCReconfigurationTAUAccept
rrcConnectionSetupComplete_SERVICEREQUEST=RRCReconfiguration

[NAS]
SECURITYPROTECTEDNASMESSAGEDN,0x270000000010742010F0640130184010200245201C109050000000000000000E0361706E05767A696D7303636F6D0501C0A80133583
2500BF6130184012301AABBCC00174F
ATTACHACCEPT,0x0742010F0640130184010200245201C109050000000000000000E0361706E05767A696D7303636F6D0501C0A801335832500BF6130184012301AABBCC00174F
ACTIVATEDDEFAULTPEPSBEARERCONTEXTREQUEST,0x5201C109050000000000000000E0361706E05767A696D7303636F6D0501C0A801335832

[CUSTOM]
RRCReconfigA2MeasId1
RRCReconfigB2MeasId2
RRCReconfigA2MeasId3
Redirect

[RELEASE]
RRCConnectionRelease
Redirect

[ADDNAS]
ACTIVATERBTTESTMODECOMPLETE,0x0F85
CLOSEUETESTLOOPCOMPLETE,0x0F81
DEACTIVATERBTTESTMODECOMPLETE,0x0F87
OPENUETESTLOOPCOMPLETE,0x0F83



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