BaiBS_RTS/RTD_3.7.x

Dual Carrier eNB

Configuration Guide

Document version: 03

About This Document

This document describes the configuration of the Nova246 dual carrier eNodeB (eNB) for software version BaiBS_RTD_3.7.x. It is a guide that how to configure the device after its installation completes.

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Revision Record

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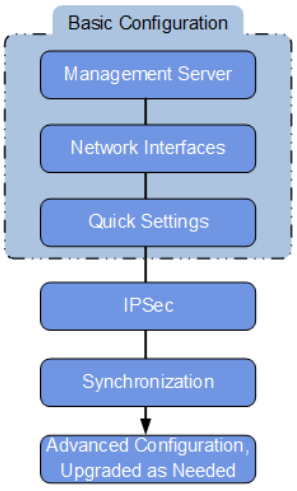
1. Configuration Flow

The Baicells eNodeB (eNB) is loaded with its own GUI for configuring its operating parameters. You can log in to the GUI either locally through the Local Maintenance Terminal (LMT), which is an Ethernet port, or remotely via IP address. You can also use the Baicells Operations and Maintenance Center (OMC) to configure the eNB; this document, however, focuses only on using the eNB GUI.

When configuring a newly installed eNB, we recommend you follow the flow that is shown in Figure 1-1.

Figure 1-1 Initial eNB Configuration Flow



NOTE: Before configuring the eNB's data, data planning needs to be done first. The data to configure includes local parameters and connecting parameters. These parameters are either provided by the user or determined after negotiation with the customers. The data to prepare include IP address, cell parameters, protocol parameters, software version, and so on.

For dual carrier eNB, the primary cell (cell1) and secondary (cell2) need to be configured. First configure the primary cell, and then click "**Access to Cell 2**" on the upper right corner to enter cell 2 to configure the secondary cell. Some parameters of the secondary cell is limited by the primary cell, the system has set these parameters to

non-configurable.

In “**LTE > Advanced > Carrier Control**”, set the eNB is a single eNB or a dual carrier eNB. After the carrier control mode is modified, reboot the eNB to take effort.

2. Login Web Client

2.1 Web Client Environmental Requirements

Table 2-1 describes the requirements on computer of the client.

Table 2-1 Environmental Requirements of the Client

Item	Description
CPU	Above Intel Core 1GHz
Memory	Above 2G RAM
Hard disk	No less than 100 MB space available
Ethernet port	10/100/1000 adaptive Ethernet interface
Operating system	• Microsoft: Windows XP, Windows Vista, Windows7, Windows 10 or above • Mac: MacOSX10.5 or above
Screen resolution	Above 1024 x 768
Browser	Chrome 6 or higher

2.2 Connect Web Client to eNB

Connect the Ethernet interface of the Web client computer to the LAN interface with Ethernet cable.

2.3 Set Up Client Computer

Before logging into the Web client, the client computer's IP address needs to be set up first so that the connection between the client and the server is possible. Take Windows 7 as an example:

1. Click "**Start>Control Panel**" and later "**Network and Internet**" in the window

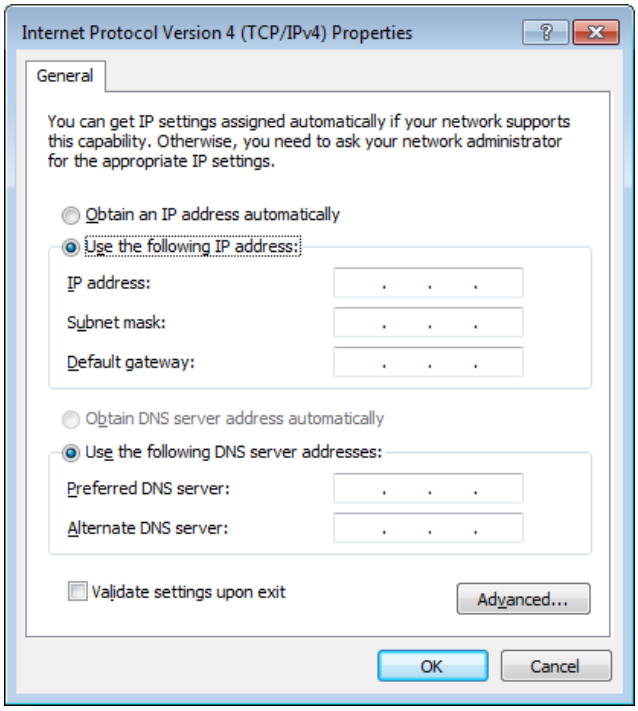
that pops up.

2. Click "**View network status and tasks**" and later "**Local Connectivity**" in the window that pops up.

3. In "**Status of Local Connectivity**", click "**Properties**" to see the "**Properties of Local Connectivity**" pop-up window.

4. Select "**Internet Protocol Version (TCP/IPV4)**" and click "**Properties**" to see the pop-up window as Figure 2-1.

Figure 2-1 Internet Protocol Version (TCP/IPV4)



Select either "**Obtain an IP address automatically**" or "**Use the following IP address**":

- If "**Obtain an IP address automatically**" selected, go directly to step 7
- If "**Use the following IP address**" selected, follow step 5 to step 7

NOTE: In general, if the auto obtaining fails, one needs to set up the IP address manually.

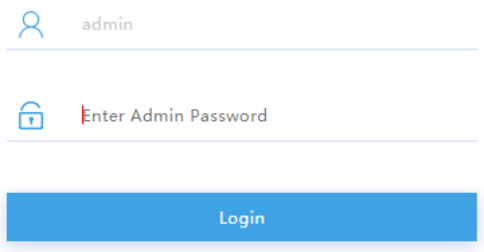
5. Select "**Use the following IP address**".
6. Input IP address, subnet mask, and default gateway, and then click "**OK**".
   - IP address: 192.168.150. XXX: (recommended XXX: 100~254)

     Because the eNB's LAN interface use the IP address of 192.168.150.1, others should avoid using this address.
   - Subnet mask: 255.255.255.0
   - Default gateway: 192.168.150.1
7. In the command window, execute ping 192.168.150.1 and check whether the connection between the client computer and the server works or not.

3. Log In

1. Open a web browser, and enter http://192.168.150.1, as shown in Figure 3-1.

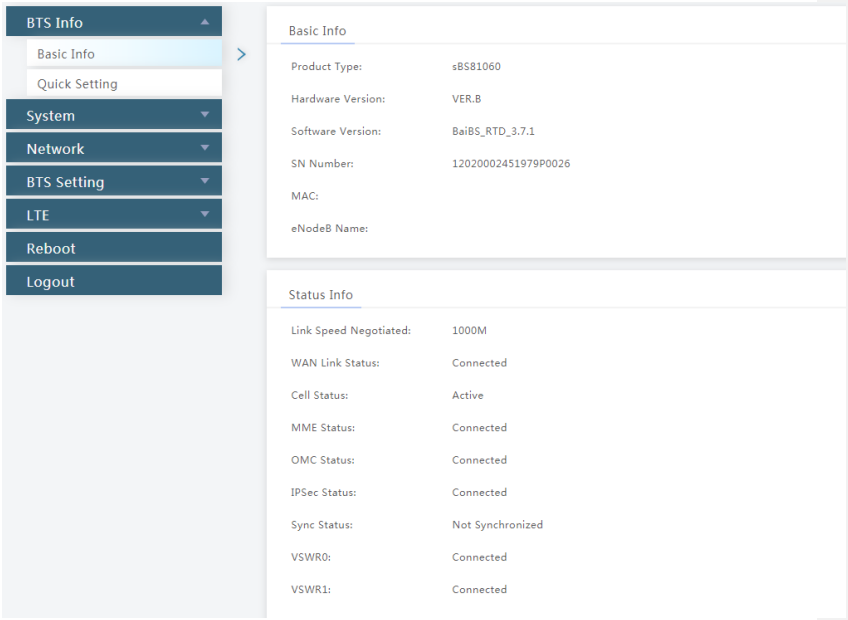
Figure 3-1 GUI Login



2. Input user name, password, and click "**Login**". The homepage of the Web client is given in Figure 3-2.

   The default user name and password are *admin*. For security seasons, you should change the password after you first log in rather than leaving the default admin. Refer "5.4 Change Password" of this document.

Figure 3-2 GUI Homepage of the eNB's



NOTE: The information may vary by product type or software version.

The homepage displays the navigation pane on the left, and shows the window for the first menu: **BTS Info > Basic Info**. This window is like a dashboard for the eNB. The top of the window shows basic information such as the product type, hardware and software version, serial number, MAC address, and eNB Name (if you configured a Cell Name for this eNB).

The Status Info section reports the status of connectivity to the backhaul, whether the cell is currently active or inactive, if the eNB has a connection to the MME in the core, OMC connectivity, IPsec tunnel connection, and GPS synchronization.

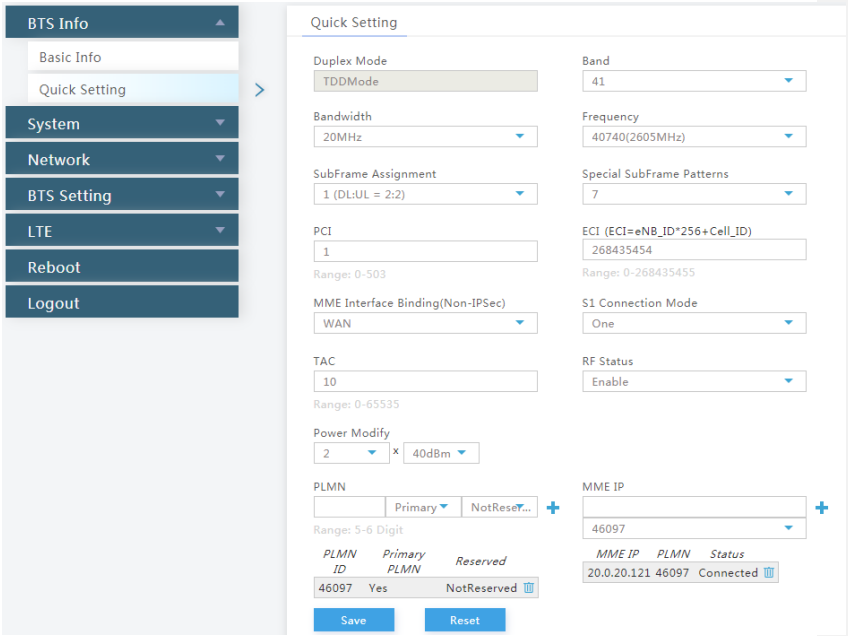
The settings for many of these fields are configured in other GUI menus. At the bottom, the window displays information about all user equipment (UE) attached to this eNB, such as aggregate number of connections, average throughput, and error rate, etc.

4. Quick Setting

The quick settings determine important RF parameters, as well as connectivity to Baicells ColudCore Evolved Packet Core (EPC). These parameters need to be planned in advance in the network planning stage.

1. In the navigation column in the left, select "**BTS Info > Quick Setting**" to enter the quick setting page, as shown in Figure 4-1.

Figure 4-1 Quick Setting



The parameter descriptions of the quick setting are given in Table 4-1.

Table 4-1 Quick Setting Parameter Description

Parameter	Description
Duplex Mode	The system presets the parameter to **TDD mode** or **FDD mode** automatically depending on model and country.

Parameter	Description
Band	The system selects the operating frequency band automatically according to the hardware board type. If SAS is enabled, the band will be assigned by the SAS vendor.
Bandwidth	Select the uplink and downlink bandwidth. [Time Division Duplexing (TDD) products only]. • 5MHz • 10MHz • 15MHz • 20MHz
Frequency	Select the eNB's operating frequency points within the band.
SubFrame Assignment	Downlink (DL) and uplink (UL) subframe configuration. • 0 (DL:UL=1:3) transmission ratio • 1 (DL:UL=2:2) transmission ratio • 2 (DL:UL=3:1) transmission ratio (default)
Special Subframe Patterns	Special subframe pattern This is a standard LTE setting that pertains to synchronization of downlink and uplink timing. The guard period between switching from DL to UL or UL to DL determines the maximum supportable cell size. The guard period has to be large enough to cover the propagation delay of DL interferers. Range is 5 or 7. Default is 7.
PCI	Physical Cell ID (PCI) allocated by the operator. PCI is an essential Layer 1 cell identity for each cell site in the network. Planning PCIs is crucial for Qos.

Parameter	Description
	Range from 0 to 503. **NOTE**: Baicells does not use and does not work with PCI 0.
CloudEPC	Enable if you are using the Baicells CloudCore EPC. When enabled, the parameters for **ECI**, **MME Interface Binding**, **TAC**, **MME IP** are automatically assigned by the EPC. When disabled, the parameter unlocks the greyed-out fields below it, e.g., **ECI**, **PLMN**, and **TAC**. When you change the Cloudcore EPC setting, it will perform a warm **reboot** of the eNB. **NOTE**: This parameter will not appear in HaloB mode.
ECI	Unique identification number for the Cell ID. Range from 0 to 268435455. The Cell ID + the eNB ID x 256 comprises the E-UTRAN Cell Identity (ECI), which identifies a cell site in the network. Example of how Cell ID is used in calculating the ECI using ENB ID*256+cell ID: ECI = 256055 if ENB ID=1000 and Cell ID=55.
MME Interface Binding (Non-IPsec)	When IP Security (IPsec) is set to enabled, this parameter is not displayed. Assign the interface for connecting to the Mobility Management Entity (MME) in the core network. Typically this will default to the interface you configure in **Network > WAN/LAN/VLAN**, e.g., WAN or VLAN.
S1 Connection Mode	The connection mode of the S1 interface between the eNB and the core network. • One: The eNB will connect only to the first MME.

Parameter	Description
	• All: The eNB will connect to all MMEs configured. **NOTE**: This parameter will not appear in HaloB mode.
TAC	Tracking Area Code of the cell site where the eNB resides. The TAC is used to determine the range of the paging information. Range from 1 to 65535.
RF Status	Enable/disable the radio frequency emissions of the eNB. The default value is enabled. If the RF status is set to be disabled, the eNB is no longer transmitting or receiving signals.
Power Modify	The maximum output power on each port. Must be within regulatory guidelines for the region. This field may be used in situations where you need to reduce the output power, such as testing the eNB before installing it on a tower; restricting the eNB output to reduce interference with other eNBs in the same geographical area; or staying within Effective Isotropic Radiated Power (EIRP) rules.
PLMN	The numerical identifier for the operator's Public Land Mobile Network (PLMN) for this cell. Must be a 5- or 6-digit number.
MME IP	IP address of the MME this eNB is connected to, which is identical to the IP address of the MME on the core network side. **NOTE**: This parameter will not appear in HaloB mode.

2. Click “**Save**” to complete the quick settings for the eNB.

NOTE: In case of incorrect parameters found before the submission, click “**RESET**” to restore

the data before the modification.

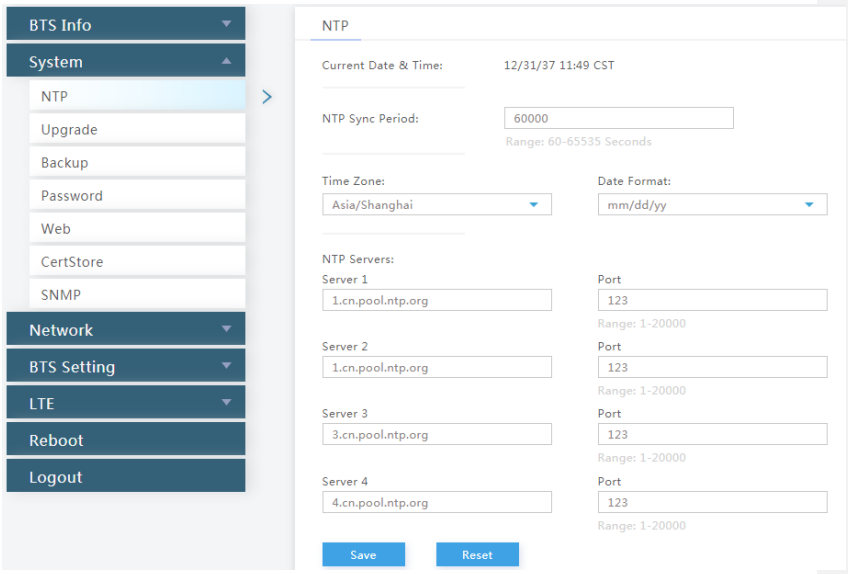
5. Configure System Parameters

5.1 Configure NTP Server

This page includes the time zone and the NTP configuration, which are configured according to the actual needs. If the NTP is used by the base station as an external clock source, up to four NTP servers are supported, where one for master NTP service and the others for backup.

1. In the navigation column in the left, select "**System > NTP**" to enter the NTP setting page, as shown in Figure 5-1.

Figure 5-1 NTP Server Settings



2. Descriptions of the parameters to configure the NTP server are given in Table 5-1.

Table 5-1 NTP Server Parameter Description

Parameter	Description

Parameter	Description
Current Date & Time	Displays the current date and time that the eNB is using.
NTP Sync Period	Network Time Protocol intervals for synchronization between the eNB and the primary NTP server. The default is 60 seconds.
Time Zone	The time zone for where the eNB is located.
Date Format	The format of the date display, e.g., mm/dd/yy.
NTP Server - Server1	Domain name or IP address of the primary NTP server. Must be consistent with the other end
Port	Primary NTP server port number. Must be consistent with the other end
Server2	Optional: Domain name or IP address of the slave NTP server.
Port	Optional: Slave NTP server port number.
Server3	Optional: Domain name or IP address of the slave NTP server.
Port	Optional: Slave NTP server port number.
Server4	Optional: Domain name or IP address of the slave NTP server.
Port	Optional: Slave NTP server port number.

3. Click “**Save**” to complete the time zone and NTP server configuration.

5.2 Upgrade

NOTE: For Cell2 configuration, this menu does not display.

When the preset version does not meet the actual need, the software version needs to be updated the latest version. The base station supports firmware upgrade, uboot

upgrade, patch upgrade and version rollback.

In the navigation column in the left, select “**System > Upgrade**”.

Caution:

Firmware upgrade and uboot upgrade may lead to the damage of the eNB file, contact the support engineer before upgrade. If necessary, the vendor will provide the technical support.

5.2.1 Firmware Upgrade

1. The user gets the firmware and save it in the web client computer.
2. Click “**Select File**” to select the firmware file saved.

   NOTE: The file type is *.IMG.
3. Check whether the software version is correct again and then click “**Update Now**”.
4. In the pop-up window click “**PROCEED**”.

   Wait for about five mins, the base station will reboot completely.

   In the “**BTS Info > Basic Info**” page, the upgraded version will be displayed in “**Software Version**".

5.2.2 Rollback

Only one rollback operation is allowed for each upgrade. Under the rollback permission of the base station, the software can roll back to the version before upgrade.

After the rollback, a new rollback will not be permitted until an upgrade has taken place.

If the previous version is “**-**”, there is no software version for rollback.

1. Click “**Click Rollback**”.
2. In the pop-up window click “**OK**”.

   Wait for about five mins, the base station will reboot completely.

In the "**BTS Info > Basic Info**" page, the version after rollback will be displayed in "**Software Version**".

5.2.3 Uboot Upgrade

1. The user gets the Uboot software version and save it in the web client computer.
2. Click "**Select File**" to select the Uboot file saved.

   NOTE: The file type is *.IMG.
3. Check whether the software version is correct again and then click "**Update Uboot**".

   Wait for about five mins, the base station will reboot completely.

   Reload the page and the upgraded Uboot version will be displayed in "**Current Version**".

5.2.4 FPGA Upgrade

1. The user gets the FPGA file and save it in the web client computer.
2. Click "**Select File**" to select the FPGA file.
3. Check whether the software version is correct again and then click "**Update FPAG**".

   Wait for about five mins, the base station will reboot completely.

5.2.5 Patch

1. The user gets the patch software version and save it in the web client computer.
2. Click "**Select File**" to select the patch file saved.
3. Check whether the software version is correct again and then click "**Update Patch**".

   Wait for about five mins, the base station will reboot completely.

   Reload the page and check the patch files in the patch list.

5.3 Backup

The Backup function is used to back up the current configuration, log files*, crash logs, and the core file, to import configuration files (e.g., to create a new eNB using the configuration from an existing eNB); or to restore all of the default configuration setting of the eNB.

*__NOTE__: The core backup file may be requested by Baicells support to assist in trouble shooting.

In the navigation column in the left, select "**System > Backup**" to enter the backup page.

5.3.1 Backup Configuration

Click "**Get Backup Files**" to save the current configuration file to the local computer.

5.3.2 Backup Log Files

- If disable "**Remote Log**", click "**Get Log Files**" to save log files to the local computer.
- If enable "**Remote Log**", enter the "**Remote log address**", and click "**Get Log Files**" to save log files to the remote log server.

5.3.3 Backup Crash Logs

Click "**Get Crash Logs**" to save the crash log files to the local computer.

5.3.4 Back Core File

Click "**Get Core Logs**" to save the core files to the local computer.

5.3.5 Import Configuration File

1. Click "**Select File**" to select the configuration file from the local computer having prepared.
2. Click "**Import LTE Configuration**" to import the configuration file.

5.3.6 Restore Default Configuration

Attention:

After the restore operation, the eNB will reboot immediately. Be careful to operate the "**Restore Default Configuration**" restore. It will disrupt the current service.

1. Click "**Restore Settings**".
2. In the pop-up download dialog box click "**OK**", the base station will reboot immediately.

   Wait for about 5 mins, the base station will reboot completely.

5.4 Change Password

The function will change the eNB administrator's (GUI) password.

1. In the navigation column in the left, select "**System > Password**" to enter the change password page.
2. Input the parameter "**New Password**" and "**Confirm Password**".

   The new password must be from 5 to 15 characters.

   NOTE: The **Reset** will rest the password to the original default setting of admin.
3. Click "**Save**" to complete the change of the administrator password.

5.5 Modify Web Port

The default http port is 80.

1. In the navigation column in the left, select "**System > Web**" to enter the http setting page.
2. If the port number needs to be modified, enter the new port number.
3. If the login timeout needs to be modified, enter the new timeout.
4. Click "**Save**" to complete the modification.

After the port number is modified, the eNB will reboot. Wait for about five minutes, enter the new port after the IP address in the address field of the browser, click "**Enter**" to log in the system again.

E.g., the IP address is 192.168.100.101, the port number is modified to 90 from 80. You need to enter 192.168.100.101:90 to log in the system.

5.6 Certificate

If the operator requires to use certificate, who will provide the certificates. The file types of the certificate are **.pem* or **.der*.

- **CA certificate**

  Root certificate is issued by the certification authority.

- **Equipment certificate**

  Certificates used for the equipment, which is public.

- **Certificate key**

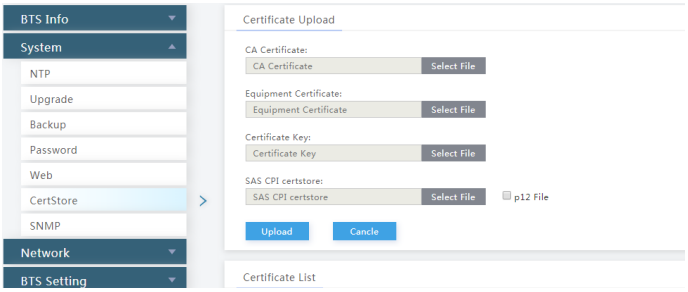
  The private key certificate paired with the device certificate, which is private for the eNB.

- **SAS CPI CertStore**

  The certification to access to Spectrum Access System (SAS).

1. Select "**System > CertStore**" to enter the certificate management page, as shown in Figure 5-2.

   Figure 5-2 Certificate



2. Click "**Select File**", select certificate from local computer.

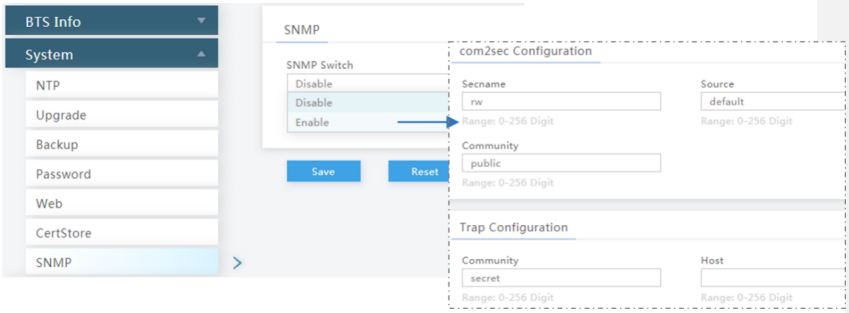
3. Click “**Upload**” to upload the certificate file to the base station.

5.7 SNMP

If the eNB will report KPI information to the third-party Network Management System (NMS), enable the Simple Network Management Protocol (SNMP) function.

1. Select “**System > SNMP**” to enter the SNMP setting page, as shown in Figure 5-3.

Figure 5-3 Configure SNMP



2. Input the SNMP configuration parameters, as shown in Table 5-2.

Table 5-2 SNMP Configuration Parameter Description

Class	Parameter	Description
com2sec Configuration	Secname	The name of security community.
	Source	The source address of acquiring information.
	Community	Define a community, default is public.
Trap Configuration	Community	Define a community, default is secret.
	Host	The IP address of host.

3. Click “**Save**” to complete the NMS configuration.

5.8 Reboot

Caution:

The reboot operation will cause all online users to go offline. It is recommended to do this operation at midnight or in the early hours of the morning.

1. In the navigation column in the left, select "**Reboot**" to enter the base station reboot page.
2. Click "**Reboot Now**" to complete the rebooting operation.

   Wait for about five mins, the base station will reboot completely. Be careful to operate this operation.

6. Configure Network Interfaces

The configuration of the network interface includes the LAN interface, DHCP service, WAN interface, VLAN and LGW.

The LAN interface is the internal maintenance interface used in initialization and will no longer be needed in normal operation.

The WAN interface is an external communication portal (Internet connection) the eNB's NMS and the MME. The eNB's NMS may be the Baicells Operations and Maintenance Center (OMC) or LTE NMS. The only option for the Interface name field is WAN. The WAN interface supports to configure multiple VLANs.

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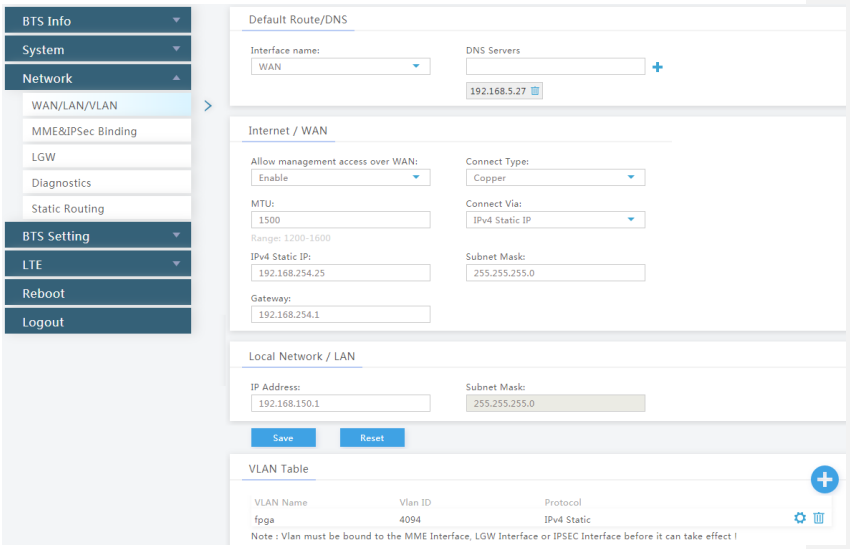
6.1 Configure WAN/LAN/VLAN

6.1.1 Configure Route/DNS

1. Select "**Network > WAN/LAN/VLAN**" to enter the network interface configuration page, as shown in Figure 6-1.

Figure 6-1 Configure Route/DNS



NOTE: When “Connect Type” is “Fiber”, the optical module information will display on this page.

2. In Default Route/DNS area, input the default route and DNS address, which descriptions are given in Table 6-2.

Table 6-1 WAN Interface Parameter Description

Parameter	Description
Interface Name	Select an interface as the default route interface.
DNS Servers	IP address of the DNS server. Multiple IP addresses are allowed.

6.1.2 Configure Internet/WAN

The eNB connects to the external network via DHCP, PPPoE, or an IPv4 Static IP.

- **Dynamic Host Configuration Protocol (DHCP)**

  The eNB’s IP address will be obtained dynamically form the local DHCP server. The current DHCP server IP address will be displayed, along with the link speed. When DHCP is selected as the connection method, there are no further WAN fields to configure in this window.

- **Point-to-point Protocol Over Ethernet (PPPoE)**

  Not recommended.

  If PPPoE is selected, you will be prompted to enter the user’s name and password. The range of each is 1 to 100 digits. You can also enter an access controller name and service name.

- **IPv4 Static IP**

  IPv4 address, netmask, and gateway or DNS, where multiple addresses are allowed.

1. In Internet/WAN area, input the configuration parameters for the WAN interface, which descriptions are given in Table 6-2.

Table 6-2 WAN Interface Parameter Description

Parameter	Description
Allow management access over WAN	Enable or disable the LMT connection from the WAN port.
Connect Type	Select the interface type of WAN interface. • Copper: RJ-45 port • Fiber: optical port
MTU	Maximum transmission unit – maximum network packet size. Default is 1500 bytes, range from 1200 to 1600 bytes.
Connect Via	The interface protocol used by WAN interface, include: • DHCP • PPPoE • IPv4 Static IP **NOTE**: The DHCP and Static IP are recommended. The following displayed parameters depend on which protocol is selected.
IPv4 Static IP	If the WAN connection is via "**IPv4 Static IP**", enter the IP address. IP address of the WAN interface.
Subnet Mask	If the WAN connection is via "**IPv4 Static IP**", enter the subnet mask address. Subnet mask of the WAN interface.
Gateway	If the WAN connection is via "**IPv4 Static IP**", enter the gateway address. IP address of the WAN interface's gateway.
User Name	If the WAN connection is via "**PPPoE**", enter the user's name.

Parameter	Description
	Authenticated user name.
Password	If the WAN connection is via “**PPPoE**”, enter the password. Authenticated PAP/CHAP password
Access Controller	If the WAN connection is via “**PPPoE**”, enter the access controller. Auto detection or provided by service provider.
Service Name	If the WAN connection is via “**PPPoE**”, enter the service name. Auto detection or provided by service provider.

2. Click “**Save**” to complete the WAN interface configuration.

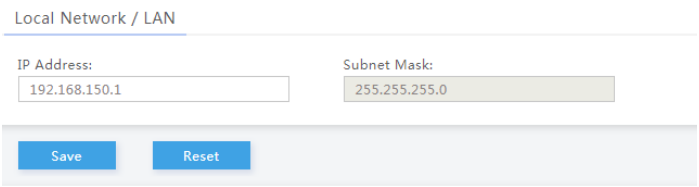
6.1.3 Configure Local Network/LAN

The Local Network/LAN fields are used to configure the Local Maintenance Terminal (LMT) port on the eNB. The port may be used during initial eNB setup and configuration.

The default IP address of the LAN interface is **192.168.150.1**. Usually, the initial value does not need to be changed.

1. In the LAN interface configuration zone, as shown in Figure 6-2.

Figure 6-2 Configure LAN Interface



2. In the Local Network/LAN, input new “**IP address**” and “**Subnet mask**”.
3. Click “**Save**” to complete the LAN interface configuration.

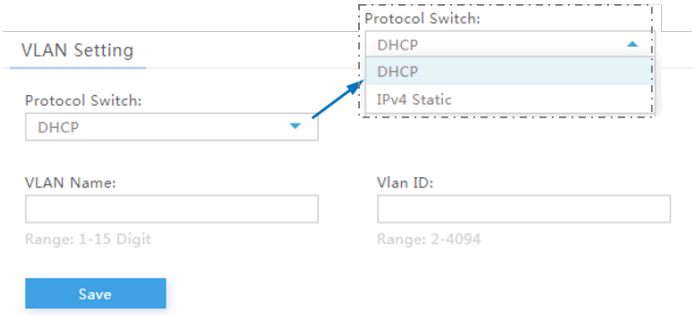
If the IP address of LAN interface is modified, the client will be interrupted immediately. You need to log in the client with the new IP address.

6.1.4 Configure VLAN

When the eNB connects to different devices, it is allowed to use different VLANs.

1. In VLAN table area, click  to display the VLAN configuration parameters, as shown in Figure 6-3.

Figure 6-3 VLAN Interface Settings



2. Input the configuration parameters of the VLAN interface. The VLAN interface supports DHCP and Static protocols. The configuration parameters depend on which protocol is selected. The parameter descriptions are given in Table 6-3.

Table 6-3 VLAN interface Parameter Description

Parameter	Description
Protocol Switch	Choose the protocol of VLAN interface. • DHCP • IPv4 Static
VLAN Name	The name of VLAN interface.
VLAN ID	The VLAN interface's ID, a unique number that must not be identical to any other VLAN. Range from 2 to 4095 Avoid entering "12", which is commonly used by the LAN

Parameter	Description
	interface.
IP Address	If the "**Protocol Switch**" is "**IPv4 Static**", enter the IP address. IP address of the VLAN interface
Netmask	If the "**Protocol Switch**" is "**IPv4 Static**", enter the netmask. Subnet mask of the VLAN interface
Gateway	If the "**Protocol Switch**" is "**IPv4 Static**", enter the IP address of the gateway. IP address of the VLAN interface's gateway

3. Click "**Save**" to complete the VLAN interface configuration.

6.2 Configure DHCP

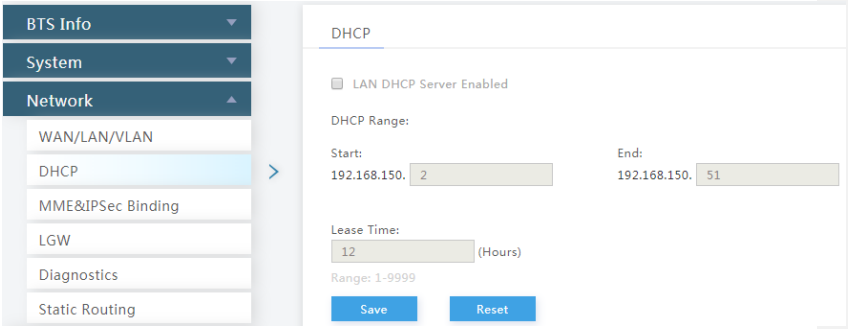
This menu is only used in eNBs when the WAN port is an optical interface.

If a local DHCP server will be used, you will enable the DHCP function and enter the start (lowest) leased IP address and the end (highest) IP address, and set the least time.

The lease time field is used to indicate how long a leased IP address remains active before it expires. The range of time is up to 9,999 hours; the default is 12 hours.

1. Select "**Network > DHCP**" to enter the DHCP configuration page, as shown in Figure 6-4.

Figure 6-4 DHCP Server Settings



2. Select whether enable the DHCP server. The default value is "**Enable**".
3. Input "**Start**" and "**End**" IP address, and input "**Lease Time**".
3. Click "**Save**" to complete the DHCP server configuration.

   Use the Reset if you want to the configuration to the original default settings.

6.3 Configure MME and IPsec Binding

6.3.1 Configure IPSsec

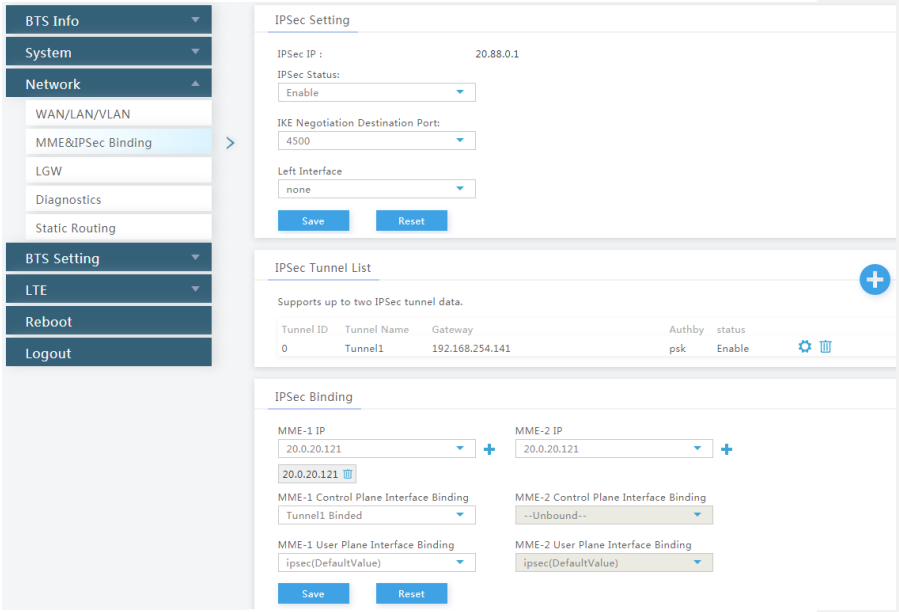
The IP Security (IPsec) interface is used to route the control plane information between the eNB and the EPC.

The security gateway in the network can provide security protocol in the network layer to ensure the safety for message transmission. If the operator have deployed the security gateway, the eNB need to enable the IPsec function accordingly.

The eNB will enable the IPsec by default, up to two IPsec tunnels are supported.

1. Select "**Network > MME&IPsec Binding**" to enter the MME and IPsec binding configuration page, as shown in Figure 6-5.

Figure 6-5 MME and IPsec Binding Settings



2. In the "**IPsec Settings**" area, set the IPsec parameter, as shown in Table 6-4.

Table 6-4 IPsec Setting Parameter Description

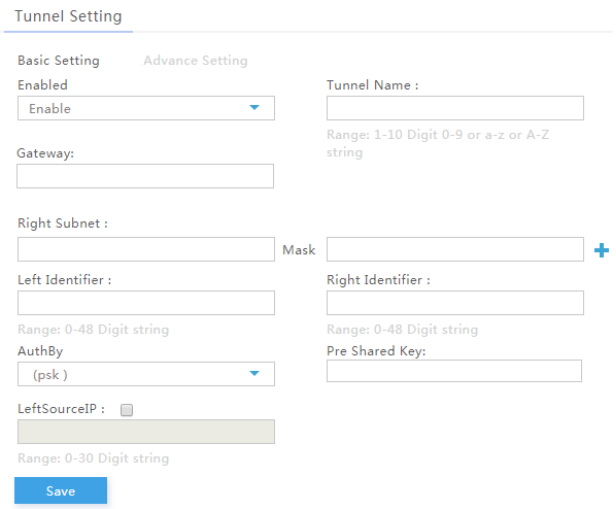
Parameter	Description
IPsec Status	Enable or disable the IP Security (IPsec). In standard mode, the system will enable the IPsec gateway by default.
IKE Negotiation Destination Port	Select the Internet Key Exchange (IKE) negotiation port. Default is 4500.
Left Interface	The interface used in the eNB side. Select from the configured interfaces.

3. Click "**Save**" to complete the IPsec function setting.

4. After the IPsec is enabled, in the "**IPsec Tunnel List**" area, click ⊕ to display

the IPsec tunnel configuration page. The basic parameters need to be configured first, as shown in Figure 6-6.

Figure 6-6 IPsec Tunnel Setting - Basic Setting Tab



The description of basic parameters is shown in Table 6-5.

Table 6-5 IPsec Tunnel Basic Parameter Description

Parameter	Description
Enabled	Enable or disable the IPsec tunnel mode. The default value is enabled.
Tunnel Name	The existing tunnel name will be shown in the window. The field will be configured only if fewer than maximum two data tunnels are correctly defined. The tunnel name may be 10 characters, either digits 0-9 or lower-case letters a-z or upper case letter A-Z.
Gateway	The security gateway (IPsec server) IP address. Make sure the IP address entered here matches the actual IP address on the security gateway side.
Right Subnet	IP address of the remote subnet, which must be consistent

Parameter	Description
	with the security gateway side. Message within this address range will be packed as a tunnel.
Mask	The subnet mask.
Left Identifier	Identification of the client end (0-48 digits string). It must be consistent with the security gateway side. If there is no security gateway left identifier, leave this field empty.
Right Identifier	Identification of the server end (0-48 digits string). It must be consistent with the security gateway side. If there is no security gateway right identifier, leave this field empty.
AuthBy	**Attention**: Change not be recommended! Authentication method of the IPsec server. Must be consistent with the security gateway side. • psk (default) • cert • AKA_psk • AKA_cert
Pre Shared Key	**Attention**: Change not be recommended! The Pre Shared Key (PSK) must be consistent with the security gateway side
Left source IP	Virtual address allocation. If absent, use the local IP address.

Caution:

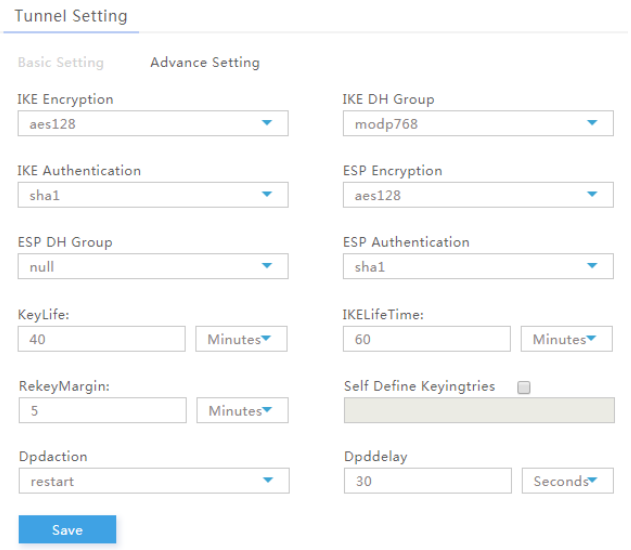
It is highly recommended that for the *Advanced Setting* fields you use the default values. Improper changes may lead to system exception.

The *Advanced Setting* fields become particularly important to network operations as

areas become denser the users.

5. Click the "**Advance Setting**" tag to enter the advanced setting page, as shown in Figure 6-7.

Figure 6-7 IPsec Tunnel Setting - Advanced Setting Tab



The description of advanced parameters is shown in Table 6-6.

Table 6-6 IPsec Tunnel Advanced Parameter Description

Parameter	Description
IKE Encryption	Internet Key Exchange (IKE) encryption method. IKE is a protocol used to ensure security for virtual private network (VPN) negotiation and remote host or network access. • aes128 • aes256 • 3des
IKE DH Group	IKE Diffie-Hellman (DF) key computation, or exponential key agreement, to be used between two entities.

Parameter	Description
	• modp768 • modp1024 • modp1536 • modp2048 • modp4096
IKE Authentication	Authentication algorithm • sha1 • sha512
ESP Encryption	Encapsulating Security Payload (ESP) – member of the IPsec protocol suite that provides origin authenticity, integrity, and confidentiality protection of packets. • aes128 • aes256 • 3des
ESP DH Group	ESP Diffie-Hellman (DF) key computation, or exponential key agreement, to be used between two entities. • modp768 • modp1024 • modp1536 • modp2048 • modp4096
ESP Authentication	ESP Authentication algorithm • sha1 • sha512
Keylife	Ipsec security association (SA) renegotiation time.

Parameter	Description
	Format: Minutes, Hours or Days.
IKELifetime	IKE security association renegotiation time. Format: Minutes, Hours or Days.
RekeyMargin	Renegotiation time before the expiry of IkelifTime (negotiate the IKE security association time before the expiry of IkelifeTime). Format: Minutes, Hours or Days.
Self Define Keyingtries	Number of renegotiation attempts after an IKE negotiation fails Default is 3.
Dpdaction	DPD stands for dead peer detection (DPD) protocol. Determines what action to take when a gateway exception occurs. • none • clear • hold • restart
Dpddelay	Time interval for sending the DPD detection message. Format: Minutes, Hours or Days.

6. Click “**Save**” to complete the IPsec tunnel configuration.

6.3.2 Configure IPsec Binding

In a typical network setup using the Baicells Cloudcore, the security tunnel is between the eNB and the MME in the core network. This menu is used to bind an IPsec tunnel with an MME IP address.

1. In the “**IPsec Binding**” area (refer to Figure 6-5), input the parameters of IPsec binding. The descriptions of these parameters is shown in Table 6-7.

Table 6-7 IPsec Binding | Parameter Description

Parameter	Descriptions
MME-1 IP	Configure the IP address of MME1.
MME-2 IP	Configure the IP address of MME2.
MME-1 Control Plane Interface Binding	The control plane interface binding with MME1.
MME-2 Control Plane Interface Binding	The control interface binding with MME2.
MME-1 User Plane Interface Binding	The user plane interface binding with MME1.
MME-2 User Plane Interface Binding	The user interface binding with MME2.

2. Click "**Save**" to complete the IPsec binding setting.

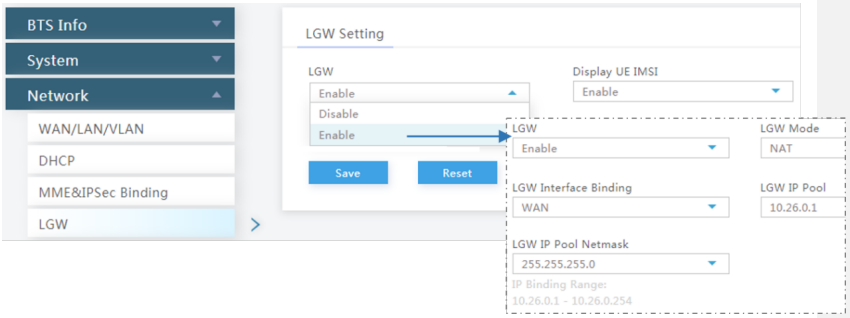
6.4 Configure LGW

The LGW should be configured when the Baicells cloudcore EPC is used. The eNB must be rebooted after the LGW configuration completed.

The Baicells eNB splits the data plane and the control plane, so there are two IP addresses per user equipment (UE). The data plane is sent out the local gateway (LGW), while the control plane is routed through an IPsec tunnel to the Cloud Evolved Packet Core (EPC).

1. Select "**Network > LGW**" to enter the LGW configuration page, as shown in Figure 6-8.

Figure 6-8 LGW Settings



2. Input the LGW configuration parameters, as shown in Table 6-8.

Table 6-8 LGW Configuration Parameter Description

Parameter	Descriptions
LGW	LGW function switch. Choose enable or disable the LGW function. The default is enabled.
Display UE IMSI	Whether display the IMIS of the UEs on “Basic Info” page.
LGW Mode	LGW mode. Select according to the actual situation of the operator’s network. • NAT: Packages from internal network to external network need NAT translation. • Router: select optimized route from the routing table. • Bridge: transfer in the data link layer.
LGW Interface Binding	The IP address LGW used for data unloading. Choose from the network interface having configured. The default value is the IP address of WAN.
LGW IP Pool	The LGW will assign a local IP address for the accessed UE to manage the UEs, here configure the first IP address of the

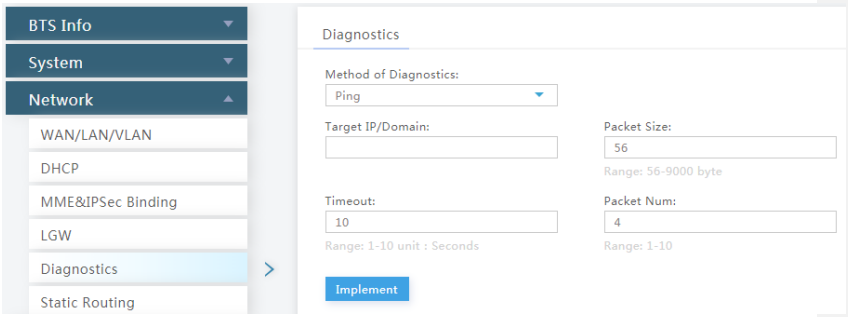
Parameter	Descriptions
	IP pool.
LGW IP Pool Netmask	For example, if the first IP address is 10.10.10.1, and the netmask is 255.255.255.0, the IP address pool includes 255 IP addresses.
Static Address	When "**LGW Mode**" is "**Router**", this parameter displays. Whether enable the static IP address.
First Address	When "**Static Address**" is "**Enable**", the parameter displays. The first IP address of the static IP address range.
Last Address	When "**Static Address**" is "**Enable**", the parameter displays. The last IP address of the static IP address range.
IMSI	When "**Static Address**" is "**Enable**", the parameter displays. Bind IMSI and the IP address.
IP	When "**Static Address**" is "**Enable**", the parameter displays. Bind IMSI and the IP address. After an IMSI and IP address is configured, click "+" to add it.

3. Click "**Save**" to complete the LGW configuration.

6.5 Diagnostics

1. In the navigation column in the left, select "**Network > Diagnostics**" to enter the diagnostics page, as shown in Figure 6-9.

Figure 6-9 Diagnostics



2. Enter the parameter of diagnostics, the descriptions are shown in Table 6-9.

Table 6-9 Parameter Description of Diagnostics

Parameter	Description
Method of Diagnostics	Select the diagnostics method. • ping • Traceroute • Iperf3
Target IP/Domain	When "**Method of Diagnostics**" is "**ping**" or "**Traceroute**", the parameter displays. The IP address or domain name of the destination.
Packet Size	When "**Method of Diagnostics**" is "**ping**", the parameter displays. The size of the packet.
Maximum Hops	When "**Method of Diagnostics**" is "**Traceroute**", the parameter displays. The maximum hops.
Timeout	When "**Method of Diagnostics**" is "**ping**" or "**Traceroute**", the parameter displays.

Parameter	Description
	Set the timeout period.
Packet Num	When “**Method of Diagnostics**” is “**ping**”, the parameter displays. The number of the packet.
CPE Test	When “**Method of Diagnostics**” is “**Iperf3**”, the parameter displays. Whether enable CPE rate test.
Mode	When “**Method of Diagnostics**” is “**Iperf3**”, the parameter displays. Select client or server.
Protocol	In Iperf3 diagnostics mode, if “**Mode**” is set to “**Client**”, the parameter displays. Select TCP or UDP protocol.
IP Address	When “**Method of Diagnostics**” is “**Iperf3**”, the parameter displays. Input the IP address of the diagnostics.
Port	When “**Method of Diagnostics**” is “**Iperf3**”, the parameter displays. Input the used port number.
Time	In Iperf3 diagnostics mode, if “**Mode**” is set to “**Client**”, the parameter displays. Set the diagnostics time.
Reverse Mode	In Iperf3 diagnostics mode, if “**Mode**” is set to “**Client**”, the parameter displays. Whether enable the reverse mode.
Client Size	In Iperf3 diagnostics mode, if “**Mode**” is set to “**Client**”, the

Parameter	Description
	parameter displays. Set the client size.

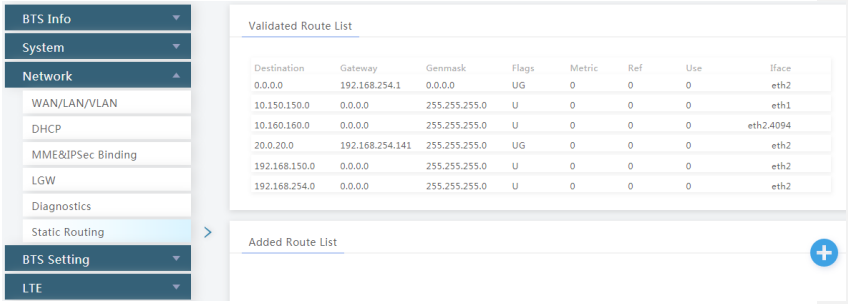
3. Click “**Implement**” to run the diagnosis operation.

6.6 Static Route

This function is used to add static IP routing addresses and monitor their status. Existing routes will display in the Route list, showing the destination address, netmask, genmask, and other data.

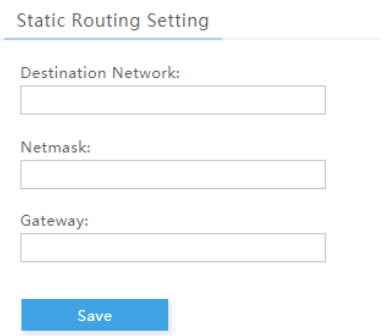
1. Select “**Network > Static Routing**” to enter the static route configuration page, as shown in Figure 6-10.

Figure 6-10 Static Route



2. Click  to display the adding static route page, as shown in Figure 6-11.

Figure 6-11 Add Static Route



3. Enter the configurations parameters of adding static route, as shown in Table 6-10.

Table 6-10 Static Route Configuration Parameter Description

Parameter	Descriptions
Destination Network	The IP address of the destination.
Netmask	The sub netmask of the destination IP address.
Gateway	The IP address of the gateway of the destination IP address.

4. Click “**Save**” to complete the adding of a static route.

   If a static route needs to be removed, click “delete” to remove it.

7. Configure BTS Parameters

The base transceiver station (BTS) settings are related to security, management, and synchronization with other network elements.

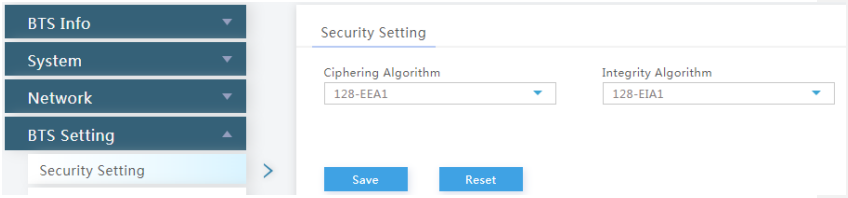
7.1 Configure Security

Caution:

DO NOT modify these security settings, keep the default value.

1. On the left navigation column, select "**BTS Setting > Security Setting**" to enter the "**Security Setting**" page, as shown in Figure 7-1.

Figure 7-1 Security Settings



2. Input the security parameters, which descriptions are given in Table 7-1.

Table 7-1 Security Parameter Description

Parameter	Description
Ciphering Algorithm	Encryption algorithm • EEA0 (recommended and default) • 128-EEA1: 128-EEA1, EEA0 • 128-EEA2: 128-EEA2, EEA0 128-EEA3: 128-EEA3, 128-EEA1, EEA0

Integrity Algorithm	Integrity protection algorithm • 128-EIA1: 128-EIA1, EIA0 (default) • 128-EIA2: 128-EIA2, EIA0 128-EIA3: 128-EIA3, 128-EIA1, EIA0

3. Click "**Save**" to complete the security algorithm setting.

7.2 Configure Management Server

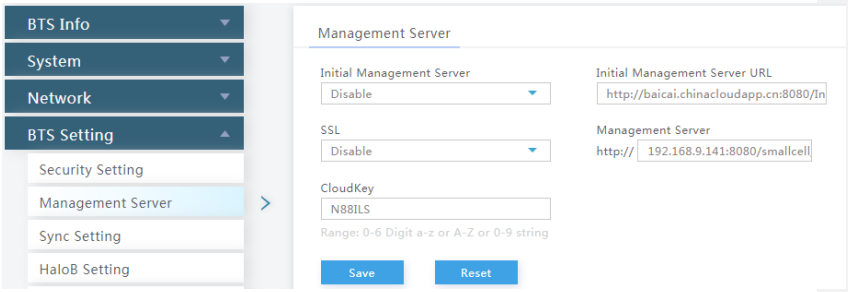
When a large amount of eNBs are deployed at one time, the Baicells provides initial server to implement the self-start, self-configuration for eNBs, The initial server is deployed in the network, eNBs are pre-configured the address of the initial server and enable the function. Once eNBs are powered on after installation, they will connect to the initial server automatically to acquire the OMC IP address.

For the Network Management System (NMS), an operator has the option to use the Baicells Cloudcore OMC, a local OMC, or other their own management server.

After the NMS settings, you can login the NMS to check whether the eNBs have been added or not. Once added, the eNB can be configured and managed on the NMS.

1. In the left navigation column, select "**BTS Settings > Management Server**" as shown in Figure 7-2.

Figure 7-2 Network Management Server Settings



2. Input the network management parameters, which descriptions are given in Table 7-2.

Table 7-2 Network Management Server Parameter Description

Parameter	Description
Initial Management Server	Whether enable the initial management server. Default is enabled.
Initial Management Server URL	The address of the initial management server. The address is pre-configured, if enabled the function, the eNB will connect to the initial server automatically after powered on, the server will issue OMC address to the eNB.
SSL	Enable or disable SSL.
Management Server	If Initial Management Server is enabled, the address is issued by the initial server. IP address and port number of the NMS. When the NMS is cloud NMS, the domain name is also supported.
CloudKey	The operator identity when the eNB registers to the NMS. The CloudKey is assigned by the NMS service provider, which is a unique bytes for each operator. When eNB registered to the NMS, the eNB can be identified by NMS. The default factory setting of CloudKey is none. When the eNB is registered to the NMS, it is assigned to the default group. The administrator needs to move the eNB to an operator. If the value of CloudKey is set to an invalid value, the NMS will deny the access of the eNB.

3. Click “**Save**” to complete the NMS configuration.

7.3 Configure Synchronization

The LTE technology standards specify timing and synchronization requirements between adjacent eNBs. Synchronized transmissions help to avoid eNBs interfering with one another, optimizes bandwidth usage, and enhance network capacity.

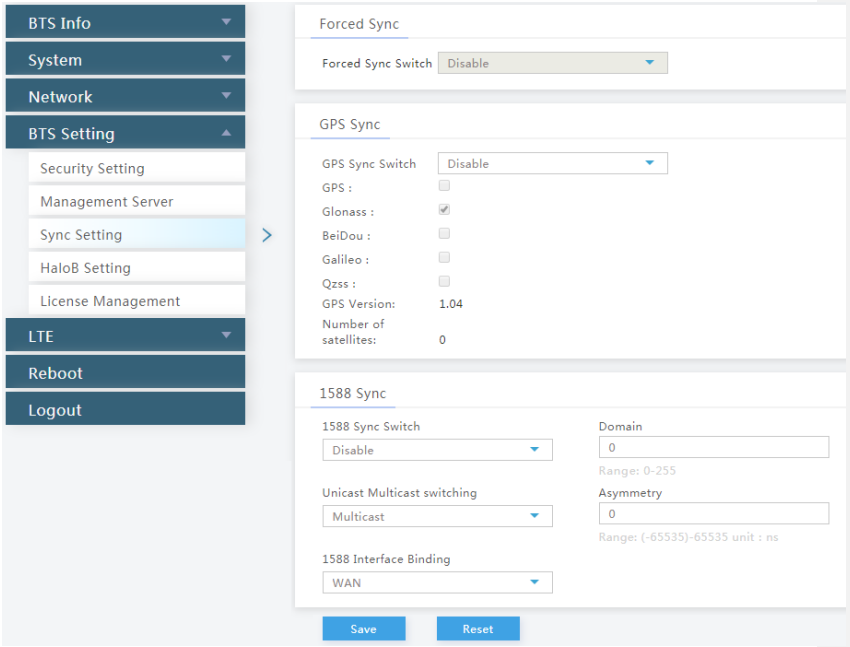
The Baicells eNBs support the GPS and 1588V2 synchronization.

7.3.1 GPS Synchronization

Before using the GPS synchronization, make sure that the GPS antenna has been installed.

1. In the left navigation column, select "**BTS Settings > Sync Settings**" to enter the synchronization configuration page, as shown in Figure 7-3.

Figure 7-3 GPS Synchronization Setting



2. Enable the switch “**Forced Sync Switch**”.
3. If select GPS synchronization, set “**GPS Sync Switch**” to “**Enable**”.
4. Choose the GPS synchronization system.

   In general, choose GPS or Glonass. The Glonass and the BeiDou cannot be selected concurrently.

   A pop-up message will tell you to reboot the eNB for the new settings to be applied.

   After the reboot, the window will display the GPS software version, the current number of satellite the GPS is tracking, and the satellite signal strength.

   Use **Reset** if you want to restore the configuration settings to the original default values.

7.3.2 1588V2 Synchronization

Using 1588v2 synchronization requires a highly reliable network environment. The network delay jitter must be less than 20μs, and the link delay must be less than 1ms. This method will not support soft routing, soft switching, or other similar devices. The operator will need to purchase a separate 1588v2 license for the eNB to support this sync mode.

1. If select 1588 synchronization, set “**1588 Sync Switch**” to “**Enable**”.
2. Set 1588 synchronization parameters, as shown in Table 7-3.

Table 7-3 1588 Synchronization Parameter Description

Parameter	Description
1588 Sync Switch	If using 1588 synchronization, enable the swtich.
Domain	Domain.
Unicast Multicast switching	Select unicast or multicast.
Asymmetry	Set asymmetry.
1588 Interface Binding	Select the binding interface of 1588.

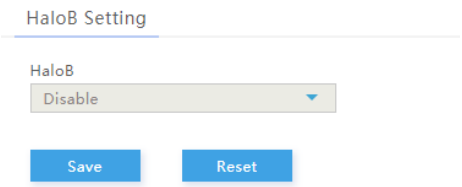
3. Click “**Save**” to complete the synchronization setting.

7.4 Configuration HaloB Function

The *HaloB setting* menu is used by operators who have a HaloB license for the eNB. This menu is used to enable/disable the eNB to operate in HaloB mode.

In the left navigation column, select “**BTS Settings > HaloB Settings**” to enter the HaloB configuration page, as shown in Figure 7-4.

Figure 7-4 HaloB Setting



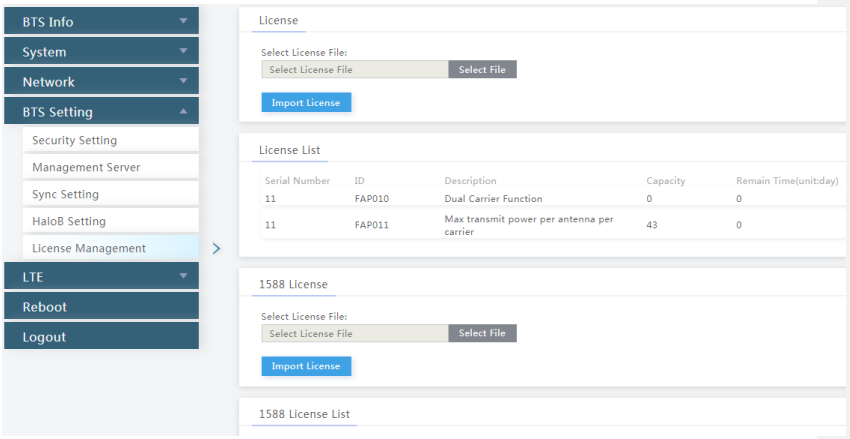
7.5 License Management

The *License Management* menu may be used to import license files for optional features, such as HaloB or regulatory certificates of authorization to operate. When imported, the files are stored in the eNB memory and shown in the License List area of this window.

The bottom half of the window pertains licenses for using one or more 1588v2 servers for transmission timing synchronization.

1. In the left navigation column, select “**BTS Settings > License Management**” to enter the synchronization configuration page, as shown in Figure 7-5.

Figure 7-5 License Management



2. Select the License file or 1588 License from the local computer.
3. Click "**Import License**" to upload the license file to the eNB.

   After the License file is uploaded, it will display in the license list.

7.6 Configure RET

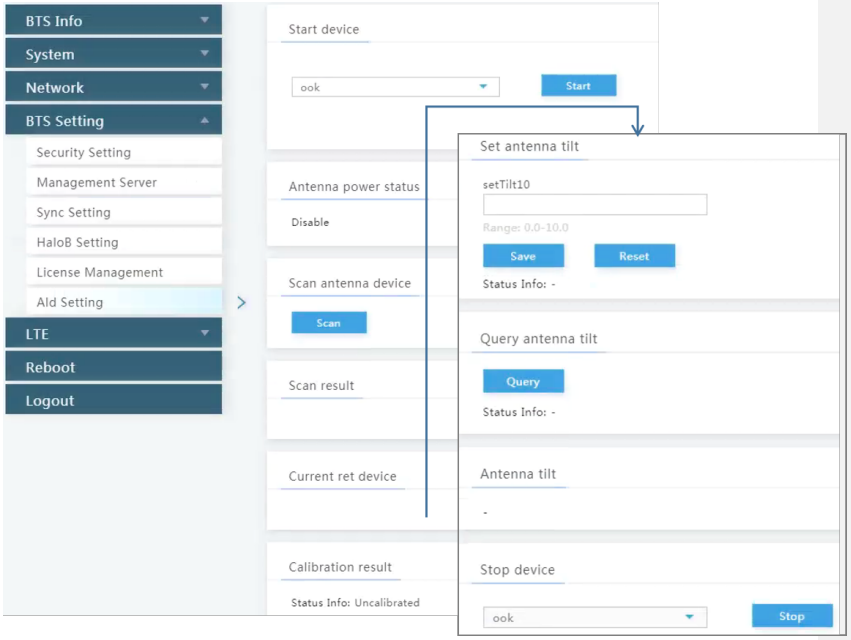
The *Ald setting* menu is used to configure the smart antenna on LMT, which adjusts the downtilt of antennas. The eNB supports two types of communication methods between the eNB and the antenna, OOK and RS485.

- **OOK**: The eNB outputs OOK signal. The signal inputs the alignment port of the antenna through bundled cable, through Antenna Information Management Module (AIMM), it is demodulated to RS485 signal to control the AIMM working.
- **RS485**: The Remote Electrical Tilt (RET) port on eNB outputs RS485 signal, connecting to AISG port on AIMM module by AISG cable to control AIMM working.

The operating steps for the RET for smart antenna on eNB is as follows.

1. In the left navigation column, select "**BTS Settings > Ald Setting**" to enter the RET setting page, as shown in Figure 7-6.

Figure 7-6 RET Setting



2. Start device.

   Select **Start ook** or **Start rs485**.

3. Make sure the antenna power status is ON.

   NOTE: When the device is Start/Stop, the system will update the status of the antenna automatically.

4. Click "**Scan**" to scan the antenna.

   After scanning, the results will display on Scan result area. If scanning is successful, you can view some information in results, such as device serial No., protocol version, etc. If scanning is failed, you need to process the problems and restart the scan until success.

5. Select RET device from the scan results, and then click "**Add**" to the current RET device list.

   NOTE: The antenna is in status of automatically calibrating, no need for manually. After

calibrating, the screen will display the calibrating result successful or failed.

6. After the calibrating is successful, set antenna tilt.

   Input the downtilt angle (setTilt10), and click “**Save**”.

   After the downtilt setting is successful, click “**Query**” to check the current downtilt.

7. **Stop ook** or **Stop rs485** to complete RET setting.

8. Configure LTE Parameters

Caution:

It is not recommended to modify the advanced LTE parameters for common operators. It is better to keep the default values. For senior experts in need, please treat it with great caution.

The *LTE* menu contains several sub-menus related to mobility as well as other radio-related settings. Many LTE parameters are important for efficient wireless network operations.

NOTE: HaloB-enabled eNBs operate as standalone entities and do not support mobility.

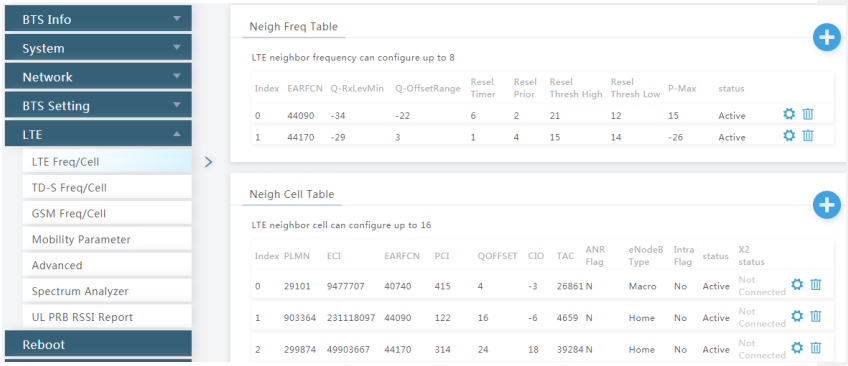
For intra-frequency cell, only the neighbor cell needs to be configured.

For intra-frequency cell, only the neighbor cell needs to be configured. For inter-frequency cell, configure the neighbor frequency first, and then configure the neighbor cell.

8.1 Configure LTE Neighbor Frequency and Cell

1. Select "**LTE > LTE Freq/Cell**" to enter the LTE neighbor frequency and cell configuration page, as shown in Figure 8-1.

Figure 8-1 LTE Neighbor Frequency/Cell Settings



Users can add, modify, and delete the LTE neighbor frequency and cell. Up to eight LTE neighbor frequencies and 16 LTE neighbor cells can be set.

LTE Neighbor Frequency

2. In the neighbor frequency list, click ⊕ to enter the page for adding a LTE neighbor frequency. The parameter descriptions are given in Table 8-1.

Table 8-1 LTE Neighbor Frequency Parameter Description

Parameter	Description
EARFCN	In short, this is the frequency point of the neighboring eNB's frequency. Range from 0 to 65,535. EARFCN stands for Envolved Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access (E-UTRA) Absolute Radio Frequency Channel Number.
Q-RxLevMin	The minimum received signal level at which user equipment (UE) will detect a neighboring eNB's signal. Only the received signal power measured by the UE is higher than this threshold, the UE can camp on this cell. A typical value is -62, which equals -124 dBm.
Q-OffsetRange	Indicates the difference in signal level between the serving and neighboring eNBs, as determined by the received signal

Parameter	Description
	level at the UE. If the received signal level is better from a neighboring eNB by at least this amount of difference in dB, the UE will reselect the other cell. The range is -24 to +24. A typical value is 0dB.
Resel Timer	Determines when the cell reselection time expires. Range is 0 to 7 seconds. A typical value is 0 second.
Resel Prior	Priority of the cell reselection to cells at this frequency. Range is 0 to 7 (integer). A typical value is 4.
Resel Thresh High	The cell reselection threshold for higher priority inter-band frequency. Represents the access threshold level, at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has a higher reselection priority than the serving cell). Range is 0 to 31dB. A typical value is 18 dB.
Resel Thresh Low	The cell reselection threshold for lower priority inter-band frequency. Represents the access threshold level at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has an absolute priority lower than the serving cell). Range is 0 to 31dB. A typical value is 13 dB.
P-Max	The maximum transmit power that UEs in this cell are allowed to use in the uplink. Range is -30 to 33 dBm. A typical value is 23 dBm.

3. Click “**Save**” to complete the LTE neighbor frequency setting.

LTE Neighbor Cell

4. In the neighbor cell list, click  to enter the page for adding a LTE neighbor cell, the parameter descriptions are given in Table 8-2.

Table 8-2 LTE Neighbor Cell Parameter Description

Parameter	Description
PLMN	The 5-6 digit PLMN that the neighbor cell belongs to.
ECI	Unique identification number for the Cell ID. Range from 0 to 268435455. The Cell ID + the eNB ID x 256 comprises the E-UTRAN Cell Identity (ECI), which identifies a cell site in the network
EARFCN	Frequency point of the neighbor cell.
PCI	Physical Cell Identifier (PCI) of the neighbor cell.
QOFFSET	Frequency offset this neighbor cell. Indicates the difference in signal level between the serving and this neighboring eNB, as determined by the received signal level at the UE. If the received signal level is better from a neighboring eNB by at least this amount of difference in dB, the UE will reselect this cell. Range is +24 to -24. A typical value is 0dB.
CIO	Cell Individual Offset (CIO) is this neighbor eNB's cell offset, which is one of the variables used to determine which eNB will best serve a given UE. Range is +24 to -24. A typical value is 0dB.
TAC	Tracking Area Code (TAC) of this neighbor cell.
eNodeB Type	The type of the eNB. Macro or Home.

5. Click "**Save**" to complete the setting of the LTE neighbor cells.

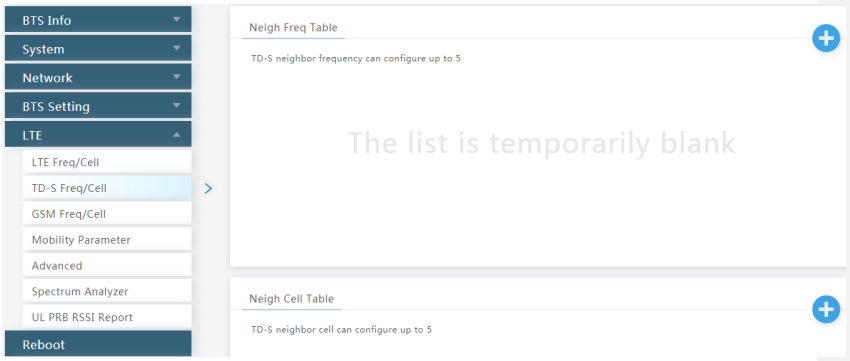
8.2 Configure TD-S Neighbor Frequency and Cell

The parameters in this menu is related to how adjacent eNBs operating with TD-SCDMA technology work with the Baicells LTE eNB that you are configuring.

You will define for the Baicells eNB how to deal with any neighboring TD-SCDMA eNBs. The maximum is 5.

1. Select "**LTE > TD-S Freq/Cell**" to enter the TD-S neighbor frequency and cell configuration page, as shown in Figure 8-2.

   Figure 8-2 TD-S Neighbor Frequency/Cell Settings



   Users can add, modify, and delete the TD-S neighbor frequency and cell. Up to 5 TD-S neighbor frequencies and 5 TD-S neighbor cells can be set.

TD-S Neighbor Frequency

2. In the neighbor frequency list, click ⊕ to enter the page for adding a TD-S neighbor frequency. The parameter descriptions are given in Table 8-3.

   Table 8-3 TD-S Neighbor Frequency Parameter Description

Parameter	Description
TDD Mode	Select a chip rate (bps) to spread the signal: UTRA_TDD_128, UTRA_TDD_384, or UTRA_TDD_768.

Parameter	Description
Bands	Channels in which the TD-S neighbor eNB operates.
UARFCN	Frequency point of the neighboring eNB's frequency.
Q-RxLevMin	The minimum received signal level at which a UE will detect a neighboring eNB's signal. Range is -60 to -13 dBm. Only the received signal power measured by the UE is higher than this threshold, the UE can camp on this cell.
Resel Prior	Priority of cell reselection to cells at this frequency.
Resel ThreshX High	The cell reselection threshold for a higher priority inter-band frequency. Represents the access threshold level at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has a higher reselection priority than the serving cell). Range is 0 to 31dB.
Resel ThreshX Low	The cell reselection threshold for a lower priority inter-band frequency. Represents the access threshold level at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has an absolute priority than the serving cell). Range is 0 to 31dB.
P-Max	The maximum transmit power UEs in this cell are allowed to use uplink. Range is -50 to -33dB.
Q-Offset	Offset between the target candidate cell and the cell currently camping on Indicates the difference in signal level between the serving and neighboring eNBs, as determined by the received signal level at the UE. If the received signal level is better from a neighboring eNB by at least this amount of difference in dB, the UE will reselect the other cell. The range is -25 to 15.

3. Click “**Save**” to complete the setting of the TD-S neighbor frequency.

TD-S Neighbor Cell

4. In the neighbor cell list, click  to enter the page for adding a TD-S neighbor cell. The parameter descriptions shown are given in Table 8-4.

Table 8-4 TD-S Neighbor Cell Parameter Description

Parameter	Description
EARFCN	Frequency point of the neighbor cell
PLMN	The PLMN that the neighbor cell belongs to
ECI	Unique identification number for the Cell ID. Range from 0 to 268435455. The Cell ID + the eNB ID x 256 comprises the E-UTRAN Cell Identity (ECI), which identifies a cell site in the network.
RNC ID	The neighbor cell’s Radio Network Controller (RNC).
Scrambling Code	The scrambling code assigned to this neighbor cell. Range is 0 to 127. The scrambling code is unique to each eNB and is used to distinguish one eNB’s data from another eNB’s data.
LAC	Location Area Code (LAC) of the neighbor cell

5. Click “**Save**” to complete the setting of the TD-S neighbor cells.

8.3 Configure GSM Neighbor Frequency and Cell

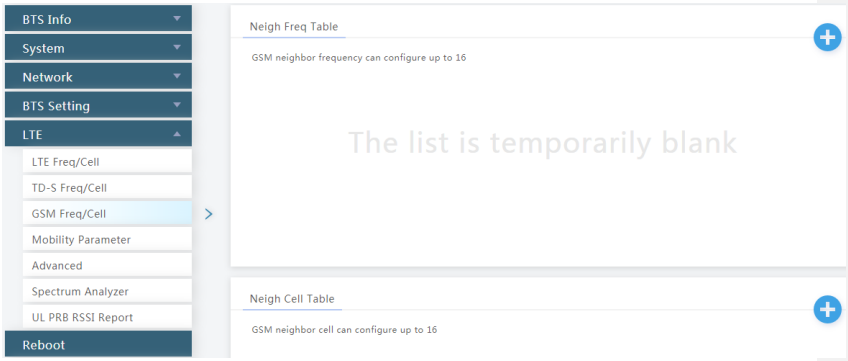
The parameters in this menu is related to how adjacent eNBs operating with GSM technology work with the Baicells LTE eNB that you are configuring.

You will define for the Baicells eNB how to deal with any neighboring GSM eNBs.

1. Select “**LTE > GSM Freq/Cell**” to enter the GSM neighbor frequency and cell

configuration page, as shown in Figure 8-3.

Figure 8-3 GSM Neighbor Frequency Settings



Users can add, modify, and delete the GSM neighbor frequency and cell. Up to 16 GSM neighbor frequencies and 16 GSM neighbor cells can be set.

GSM Neighbor Frequency

2. In the neighbor frequency list, click ⊕ to enter the page for adding a GSM neighbor frequency. The parameter descriptions are given in Table 8-5.

Table 8-5 GSM Neighbor Frequency Parameter Description

Parameter	Description
BAND	Channels in which the GSM neighbor eNB operates: GSM850, GSM900, DCS1800, or PCS1900.
ARFCN	Frequency point of the GSM neighbor eNB's frequency
Resel Thresh High	The cell reselection threshold for a higher priority inter-band frequency. Represents the access threshold level at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has a higher reselection priority than the serving cell). Range is 0 to 31dB

Parameter	Description
Resel Thresh Low	Represents the access threshold level at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has an absolute priority than the serving cell). Range is 0 to 31dB.
Resel Prior	Priority of the cell reselection to cells at this frequency.
Q-RxLevMin	The minimum received signal level at which a UE will detect a neighboring eNB's signal. Range is 0-45dbM. Only when the received signal power measured by the UE is higher than this threshold, the UE is allowed to camp on this cell.

3. Click "**Save**" to complete the setting of the GSM neighbor frequency.

GSM Neighbor Cell

4. In the neighbor cell list, click  to enter the page for adding a GSM neighbor frequency. The parameter descriptions as given in Table 8-6.

Table 8-6 GSM Neighbor Cell Parameter Description

Parameter	Description
ARFCN	The frequency point of the neighbor eNB's frequency.
PLMN	The PLMN that the neighbor cell belongs to.
LAC	Location Area Code (LAC) of the neighbor cell.
BSIC	Basic station identification code (BSIC) of the neighbor cell.
ECI	Unique identification number for the Cell ID. Range from 0 to 268435455. The Cell ID + the eNB ID x 256 comprises the E-UTRAN Cell Identity (ECI), which identifies a cell site in the network

5. Click “**Save**” to complete the setting of the GSM neighbor cell.

8.4 Configure Mobility Parameter

In the left navigation column, select “**LTE > Mobility Parameter**” to enter the mobility parameter configuration page.

The *Mobility Parameter* menu pertains to how roaming UE sessions are handle between different eNBs in the same service area. When a UE is actively connected to an eNB is referred to as the serving eNB or cell. The other eNBs in the area are referred to as either neighbor or target eNBs or cells.

The process of a device moving from cell to cell and changing over from its serving eNB to a neighbor (target) eNB is called handoff or handover. The UE exchange information with its serving eNB to perform cell selection and reselection based on parameters which you will set for each eNB.

8.4.1 A1 Event Threshold

The LTE A1 event is triggered when the serving cell’s Reference Signal Received Power (RSRP) is better than the A1 threshold. The A1 event can be used to turn off certain inter-cell measurements.

1. Click “**A1 Event Threshold**” to display the A1 event threshold configuration parameter, as shown in Table 8-7.

Table 8-7 A1 Event Threshold Parameter Description

Parameter	Description
LTE A1 RSRP Threshold	RSRP threshold of A1 event.
A1 Hysteresis	Handover hysteresis of A1 event.
A1 Time To Trigger	Delay time of A1 handover event.

2. Click “**Save**” to complete the A1 event threshold setting.

8.4.2 A2 Event Threshold

The LTE A2 event is triggered when the serving cell's Reference Signal Received Power (RSRP) is better than the A2 threshold.

1. Click "**A2 Event Threshold**" to display the A2 event threshold configuration parameter, as shown in Table 8-8.

Table 8-8 A2 Event Threshold Parameter Description

Parameter	Description
LTE A2 RSRP Threshold	RSRP threshold of A2 event.
A2 Hysteresis	Handover hysteresis of A2 event.
A2 Time To Trigger	Delay time of A2 handover event.

2. Click "**Save**" to complete the A2 event threshold setting.

8.4.3 A3 Event Threshold

The LTE A3 event is triggered when the neighbor cell becomes better than the serving cell by as much as the offset value. The offset can be either positive or negative.

1. Click "**A3 Event Threshold**" to display the A3 event threshold configuration parameters, which descriptions are given in Table 8-9.

Table 8-9 A3 Event Threshold Parameter Description

Parameter	Description
Intra-Freq Handover A3 Offset	The A3 event offset in the scenes of the intra frequency handover. Range from -30 to 30 (integer). The default value is 10. In this example, the recommended value is 10 (integer), which means 1080.5 = 5 dB.
A3 Hysteresis	Specifies the entering (A1-1) and leaving (A3-2) conditions for

Parameter	Description
	A3 events. Range from -30 to 30 (integer).
A3 Time To Trigger	The period of time that specific criteria for the A3 event are met in order to trigger a measurement report.

2. Click "**Save**" to complete the A3 event threshold setting.

8.4.4 A5 Event Threshold

The LTE A5 event is triggered when the serving cell becomes worse than Threshold 1 while a neighbor cell becomes better than Threshold 2. A5 event can control the edge of handover out of the serving cell and the edge of handover in of the neighbor cell.

1. Click "**A5 Event Threshold**" to display the A5 event threshold configuration parameters, which descriptions are given in Table 8-10.

Table 8-10 A5 Event Threshold Parameter Description

Parameter	Description
Inter-Freq Handover A5 RSRP Threshold1	RSRP threshold 1 of the A5 event. Range from 0 to 97 (integer). The default is 70. In the example, the recommended value is 40 (integer): equals -140 dBm + 40 = -100dBm.
Inter-Freq Handover A5 RSRP Threshold2	RSRP threshold 2 of the A5 event. Range from 0 to 97 (integer). The default is 65. In the example, the recommended value is 45 (integer): equals -140 dBm + 45 = -95dBm.
A5 Hysteresis	The value of hysteresis for A5 event.
A5 Time To Trigger	The period of time that specific criteria for the A5 event are met in order to trigger a measurement report.

2. Click “**Save**” to complete the A5 event threshold setting.

8.4.5 B2 Event Threshold

The B2 Event Thresholds pertains only to TD-SCDMA and GSM adjacent cells, not to adjacent LTE cells.

1. Click “**B2 Event Threshold**” to display the B2 event threshold configuration parameters, which descriptions are given in Table 8-11.

Table 8-11 B2 Event Threshold Parameter Description

Parameter	Description
UTRA B2 RSRP Threshold1	Threshold parameter 1 of the UTRA Time Domain Scheduling (TDS) based B2 event
RSRP Threshold 2	Threshold parameter 2 of the Reference Signal Received Power (RSRP) based B2 event
GERAN B2 RSRP Threshold1	Threshold parameter 1 of the GSM Edge Radio Access Network (GERAN) B2 event based on RSRP.
GERAN B2 IRAT Threshold2	Threshold parameter 2 of the GERAN B2 event based on Inter-Radio Access Technology (IRAT).

2. Click “**Save**” to complete the B2 event threshold setting.

8.4.6 Measurement Control Parameter

The *Measurement Control* parameters determine how frequently the UE measures the serving and neighboring eNB’s RSRP values and at what level of hysteresis-based RSRP triggers a handover. The UE evaluate the RF conditions around it and reports the information to the serving eNB. The eNB’s radio resource management function evaluates the measurements and determines whether or not to hand over the session to a neighbor eNB.

1. Click “**Measurement Control Parameters**” to display the measurement control parameters configuration parameters, which descriptions are given in Table 8-12.

Table 8-12 Measurement Control Parameter Description

Parameter	Description
Hysteresis	Refers to the hysteresis (historical records) of the handover measurement event. The value is used to avoid the frequent triggering of cell handover evaluation due to the fluctuation in wireless signals. This setting tells the UE, if you hear another eNB with at least this amount of dB better, initiate a handover. The lower the number the sooner the handover is initiated. If set too low, it may cause the UE to ping-pong between eNBs. Such events are tracked by the eNB, but not by the eNB. Range from 0 to 30dB. The default is 0. In this example, the recommended value is 5dB.
Time To Trigger	Length of time the target cell RSRP value is better than the serving cell before the UE initiates a handover request..

2. Click "**Save**" to complete the measurement control parameter setting.

8.4.7 Cell Selection Parameter

When the UE selects a PLMN, it will select an appropriate cell to residence.

1. Click "**Cell Selection Parameter**" to display the cell selection parameters configuration parameters, which descriptions are given in Table 8-13.

Table 8-13 Cell Selection Parameter Description

Parameter	Description
Qrxlevmin (dBm)	The minimum acceptable signal level at the UE before cell selection. The unit is dBm. By defining this parameter, it will avoid the UE to access the cell with low receiving signal level. The value of this parameter needs to take factors such as cell size, cell coverage and background noise into comprehensive consideration.

Parameter	Description
	Reducing the parameter value will expand the allowable access range of the cell, but it may result in poor call quality.
Qrxlevminoffset	The minimum level offset (difference) in RSRP at the UE needed for cell selection. When the UE residing on a VPLMN periodically searches for a higher-level cell, the minimum threshold value is offset to prevent ping-pong effect.

2. Click "**Save**" to complete the cell selection parameters setting.

8.4.8 Cell Reselection Parameter

When an UE is in idle state, it needs to select a better cell by monitoring the signal quality of the neighbor cell and the serving cell. Cell reselection includes the intra-frequency cell reselection and the inter-frequency cell reselection. The intra-frequency cell reselection mainly solves the problem of wireless coverage. The inter-frequency cell reselection can solve the problem of wireless coverage, but also to achieve the load balance between different frequency points.

1. Click "**Cell Reselection Parameter**" to display the cell reselection parameters configuration parameters, which descriptions are given in Table 8-14.

Table 8-14 Cell Reselection Parameter Description

Parameter	Description
S-IntraSearch	Intra-frequency measurement threshold that must be met before the UE will reselect a neighbor eNB. Range is 0 to 31 (integer). In this example, the recommended value is 31 (integer), which means 31*2 = 62 dB.
S-NonIntraSearch	Inter-frequency measurement threshold that must be met before the UE will reselect a neighbor eNB.
Qrxlevmin (dBm)	The minimum level for reselection. Range is -70 to -22

Parameter	Description
	(integer). In this example, the recommended value is -62 (integer), which means -62*2 = -124 dB.
Qhyst	Delay time for reselection. General the value of the parameter is 2. This parameter will overestimate the signal strength of the serving cell to delay the cell reselection.
Reselection Priority	Priority for the reselection. Range is 0 to 7. In this example, the recommended value is4.
ThreshServingLow	Threshold for reselection to cells of lower priority.
Allowed Meas BW Sib3	Measurement bandwidth allowed.

2. Click "**Save**" to complete the cell reselection parameters setting.

8.5 Configure Advanced Parameter

Caution:

Many, if not all, of the *Advanced* settings should be left with their default values. Any modification should be determined only by experienced wireless professionals.

In the left navigation column, select "**LTE > Advanced**" to enter the advanced parameter configuration page.

The *Advanced* settings are primarily used to fine-tune the RF settings and co configure special features.

8.5.1 X2 Enable Switch

An X2 interface is a logical interface which may be enabled for intra-LTE eNB handover when the Mobility Management Entity (MME) being used for the UE is the same for both the serving and the target eNB. If enabled, the two eNBs can

communicate directly with one another without communication through a radio network controller (RNC). The X2 starts buffering on the target eNB in advance of a handover.

By default, the X2 interface parameter is disabled. The recommended setting is Enable.

1. Click "**X2**" to display the X2 switch parameters.
2. The system default value for "**X2**" is "**Disable**". If needed, change it accordingly to "**Enable**".
3. Click "**Save**" to complete the X2 switch setting.

8.5.2 Power Control Parameters

The *Power Control Parameters* help to limit UE transmit power to the eNB being configured, including the power of the transmitted reference signals. The parameters factor into the overall RF link buget.

1. Click "**Power Control Parameters**" to display the power control parameters, which descriptions are given in Table 8-15.

Table 8-15 Power Control Parameter Description

Parameter	Description
p-Max	The maximum power that a UE can transmit in this cell.
Reference Signal Power	Transmit power of the reference signals.
Power Ramping	Step size of the Physical Random-Access Channel's (PRACH's) power index broadcast to the UEs via a Layer 1 channel used by UEs to access the mobile network for call setup and bursty data transmission.
Preamble Init Target Power	Initial power of PRACH.
$P_{o\_nominal\_pusch}$	Physical Uplink Shared Channels (PUSCH) carries user data. It supports Quadrature Phase Shift keying (QPSK) and 16 Quadrature Amplitude Modulation (QAM), with

Parameter	Description
	64QAM being optional. Range is -126 to 24 dB.
$P_{o\_nominal\_pucch}$	Physical Uplink Control Channels (PUCCH) is used to carry Uplink Control Information (UCI). LTE UEs can never transmit both PUCCH and PUSCH during the same subframe. Range is -127 to -96 dB.
Alpha	Power control loss compensation factor, which controls the UE power.
Max Pathloss	The maximum threshold at which the UE determines not to transmit to the eNB based on path loss. Path loss is the difference between the transmitted reference signal information and the actual received signal power.
Basic ULTarget SINR	Desired Signal-to-Interference-Plus-Noise Ratio (SINR) level to ensure an acceptable level of communication between the UE and the eNB, while also controlling interference that might be caused to neighboring cells.
$P_{o\_ue\_pucch}$	Initial UE transmit power when using PUCCH.
$P_{o\_ue\_pusch}$	Initial UE transmit power when using PUSCH.
PA	Physical Downlink Shared Channel (PDSCH) is the main data bearing channel. Power bossting the reference signal is allocated to UEs on a dynamic and opportunistic basis. The relative PDSCH power is determined by computed parameters: P_a and P_b. Traffic loading must be balance with controlling interference to neighboring cells.
PB	See description for parameter “PA”.

2. Click “**Save**” to complete the power control parameters setting.

8.5.3 eNodeB Setting

The *eNodeB Setting* menu is used to name the eNB you are configuring and select the eNB type.

1. Click "**eNodeB Settings**" to display the eNB configuration parameters which descriptions are given in Table 8-16.

Table 8-16 eNodeB Parameter Description

Parameter	Description
eNodeB Name	An eNB name consists of English letters, numbers and special characters, with a maximum length of 48 characters. By default it is empty.
eNodeB Type	The type of the eNB. • Macro: the eNB is covering a large cell area and the transmission power is on the higher end of the power range. • Home: the eNB's transmission power is much lower than Macro and covers a much smaller area.

2. Click "**Save**" to complete the eNB setting.

8.5.4 GAP Settings

The Inter-frequency Measurement Gap (*Inter-Frequency Means GAP*) field pertains to how a UE measures the signal quality of a neighbor cell that is operating at a different frequency from the serving cell. The gap parameter creates a time gap during which the UE will not receive or transmit with the serving cell. It will switch its frequency to the target cell and perform a measurement of signal quality before coming back to the serving cell.

1. Click "**GAP Settings**" to display the GAP configuration parameter.
2. Input the "**Inter-Frequency Meas GAP**" value. Either 1 or 2, and the default is 1.

- 1 is a GPA measurement period of 40ms
- 2 is a GPA measurement period of 80ms

3. Click "**Save**" to complete the GAP setting.

8.5.5 RRC Status Parameters

Under Radio Resource Control Status (*RRC Status Parameters*), you will configure parameters related to how the RRC protocol in the air interface control plane establishes, maintains, and release an RRC connection between UEs and the eNB.

1. Click "**RRC Status Parameters**" to display the RRC status configuration parameters, which descriptions are given in Table 8-17.

Table 8-17 RRC Status Parameter Description

Parameter	Description
Ue Inactivity Timer	Expire time of the UE inactive status timer (s). If set to 0, the timer does not take effort. The UE inactive status duration is equal to the RRC inactivity timer * the maximum expiry count.
Max Expiry Count	Maximum number of the UE's inactive status timer expiries.

2. Click "**Save**" to complete the RRC status parameters setting.

8.5.6 SON Function

The Self-Organizing Network (SON) Function Settings refer to standard-based automation technology designed to make the planning, configuration, management, optimization, and healing of mobile radio access network (RANs) simpler and faster. When enabled, the eNB will auto-configure these mobility related values.

1. Click "**SON Function Switch**" to display the SON function configuration parameters, which descriptions are given in Table 8-17.

Table 8-18 SON Function Parameter Description

Parameter	Description
PCI Selfconfig	Enable or disable self-configuration of the eNB Physical Cell Identifier (PCI) and other RF settings. Default: Disable Only when this parameter is set to "**Enable**", the PCI conflict detection is allowed.
PCI Self-configuring Option List	The PCI numbers to use. When "**PCI Selfconfig**" is set to enable. Here adds the PCI self-configuration list.
Home eNodeB Start PCI	Starting PCI number. Range is 0 to 503.
Home eNodeB PCI Range	The last PCI number that may be used.
ANR report Type	Automatic Neighbor Relation (ANR) trigger. • No ANR • STRONG CELL • INTRA&INTER
Period report amount	Specifies the number of measurement reports applicable for the event threshold period.
Intra-Freq ANR A3 Offset	The offset of ANR A3 event for intra frequency handover.
Inter-Freq ANR A5 RSRP Threshold1	The threshold 1 of ANR A5 event for inter frequency handover.
Inter-Freq ANR A5 RSRP Threshold2	The threshold 2 of ANR A5 event for inter frequency handover.

2. Click "**Save**" to complete the SON function setting.

8.5.7 Random Access Parameters

The preamble format to be used in a specific cell is messaged from the eNB to the UEs using a Physical Random-Access Channel (PRACH) configuration index. The UE uses the preamble to access the network when it is first powered on.

1. Click "**Random Access Parameters**" to display the random access configuration parameter, which descriptions are given in Table 8-19.

Table 8-19 Random Access Parameter Description

Parameter	Description
Preamble Format	Packet preamble format (based on the PRACH) to be used for this cell and communicated to UEs. • 0: send PRACH on normal subframe, the farthest covered distance is 14km. • 2: send PRACH on normal subframe, the farthest covered distance is 29km. • 4: send PRACH special subframe, the farthest covered distance is 1km.
Prach-Configuration Index	The PRACH configuration index number that will be broadcast to the UEs via SIB2.
Zero Correlation Zone Config	Specifies the cyclic shift intervals to generate the preamble sequence.
PRACH Freq Offset	Determines the location of the PRACH preamble in the frequency domain.
PRACH Root Sequence	Index broadcast by the eNB and used by UEs to calculate the preamble they should use to attach to the eNB. This value cannot be the same as the value of the neighbor cell.

2. Click "**Save**" to complete the random access parameters setting.

8.5.8 Working Mode

1. Click "**Working Mode**" to display the work mode parameters.
2. Select the mode work, "*Low Delay Mode (32UE)*" or "*Multi-user Mode (96UE)*".
3. Click "**Save**" to complete the work mode setting.

8.5.9 Scheduling Algorithm

The *Scheduling Algorithm* fields are important for smooth RF operation and can impact key performance indicators such as cell throughput, cell edge users, Voice Over IP (VoIP) capacity, and QoS of data service.

1. Click "**Scheduling Algorithm**" to display the scheduling algorithm configuration parameter, which descriptions are given in Table 8-20.

Table 8-20 Scheduling Algorithms Parameter Description

Parameter	Description
Scheduling Algorithm	Select scheduling algorithm. • **PFS algorithm**: Balance between user channel quality and fairness, both cell throughput and user fairness taken into account. • **RR algorithm**: Allocate the resource and opportunities to all terminals equally. QoS not taken into account, and memory not used.
Proportional Fair Factor	When "**Scheduling Algorithm**" is "**PFS algorithm**", the parameter is displays. Set the fair factor of PFS algorithm.

2. Click "**Save**" to complete the scheduling algorithm setting.

8.5.10 Sync Adjust Parameter

The *Sync Adjust Parameters* help the system to compensate for packet delay in the

uplink and downlink. **Do not modify these fields**.

1. Click "**Sync Adjust Parameter**" to display the synchronization adjust configuration parameter, which descriptions are given in Table 8-21.

Table 8-21 Sync Adjust Parameter Description

Parameter	Description
GPS or 1588 Sync Adjust Value	The GPS synchronous phase adjustment value. Range is -200 to 2000.
ICTA Adjust Value	The Industry Council for Tangible Assets (ICTA) adjust value. Range is -200 to 2000.

2. Click "**Save**" to complete the synchronization adjust setting.

8.5.11 Link Activation State Detector

The *Link Activation State Detector* is used to enable or disable a link watchdog. If you select *Enable*, a watchdog action will check the UE every "x" minutes to see if it is connected or disconnected from the EPC, LAN, or both, and if disconnected after "x" number of minutes the watchdog will perform a warm reboot the UE. If you select *Disable*, the watchdog will not reboot the UE.

1. Click "**Link Activation State Detector**" to display the link activation state detector configuration parameter, which descriptions are given in Table 8-22.

Table 8-22 Link Activation State Detector Parameter Description

Parameter	Description
Link Keep Alive	Enable or disable the link activation state detector between the UE and EPC, LAN, or both.
Link Keep Alive Timer	When "**Link Keep Alive**" is set to "**Enable**", the timer is need to set. • 5 mins

Parameter	Description
	• 10 mins • 15 mins Default is 5 mins.

2. Click “**Save**” to complete the link activation state detector setting.

8.5.12 ICIC Setting

In LTE, Inter-cell Interference Coordination (ICIC) reduces inter-cell interference by having UEs that are at the same cell edge but attached to different cells use different frequency resources. This is typical for roaming scenarios and sometimes PCI conflicts.

1. Click “**ICIC Setting**” to display the ICIC parameters, which descriptions are given in Table 8-23.

Table 8-23 ICIC Function Parameter Description

Parameter	Description
SRF	Enable or disable Single Frequency Reuse (SRF). If enabling the parameter, configure the following parameters.
CEU Decision Offset	Common Equipment Unit (CEU) frequency offset.
CEU Decision Hysteresis	CEU hysteresis threshold.
CEU Report Interval	CEU reporting interval, in milliseconds or minutes.
CEU Report Amount	Limit number of CEU reports per reporting period (integer).
CEU PRB Range	CEU Physical Resource Block (PRB) range.
PA Adjustable	Enable or disable Power Amplifier (PA) adjustment.

2. Click “**Save**” to complete the ICIC setting.

8.5.13 Signaling Trace

The *Signaling Trace* function is typically used for troubleshooting UE attachment and handover issues. During a signaling trace, RRC and SCTP packets are captured in real-time. The packet are sent to a remote computer running Wireshark or a Local OMC and displayed so the data can be analyzed.

The RRC protocol controls the UE and eNB over-the-air communications, and is especially important during mobility scenarios as a mobile user is handed off from one eNB to another. SCTP is a transport protocol layer for the S1-MME signaling bear and is responsible for the Envolved Packet System (EPS) bearer setup/modification/release, handover procedures, Non-Access Stratum (NAS) signaling transport, and paging procedures.

1. Click “**Signaling Trace**” to display the signaling trace parameters, which descriptions are given in Table 8-24.

Table 8-24 Signaling Trace Parameter Description

Parameter	Description
RRC Signaling Trace Switch	Enable or disable the RRC signaling trace function.
RRC Signaling Trace OMC Format	Enable or disable sending the RRC signaling trace data to the local OMC.
RRC Signaling Trace Dest IP	The IP address of the computer where RRC signaling trace data will be sent. Default is 127.0.0.1, which should be changed.
RRC Signaling Trace Dest Port	The port number of the computer where RRC signaling trace data will be sent. Range is 0 to 65535. Default is 4337. **NOTE**: For MAC computer, if there is an existing MAC packet (directory) make sure you use a different port number for the RRC packet.

Parameter	Description
RRC Signaling Trace Duration	The duration of the RRC signaling trace. Range is 0 to 30 minutes. A value of zero (0) means continuous.
SCTP Signaling Trace Enable Switch	Enable or disable the the computer where SCTP signaling trace function.
SCTP Signaling Trace OMC Format	Enable or disable sending the SCTP signaling trace data to the local OMC.
SCTP Signaling Trace Dest IP	The IP address of the computer where the SCTP signaling trace data will be sent. Default is 127.0.0.1, which should be changed.
SCTP Signaling Trace Dest Port	The port number of the computer where the SCTP signaling trace data will be sent. Range is 0 to 65535. Default is 36412.
SCTP Signaling Trace Duration	The duration of the SCTP signaling trace. Range is 0 to 30 minutes. A value of zero (0) means continuous.

2. Click "**Save**" to complete the signaling trace setting.

8.5.14 RF Status and Parameter

Click "**RF Status and Parameter**" to view the current status of antennas.

8.5.15 Cell Access Control Setting

The *Cell Access Control* menu is for operators who have deployed a local EPC in their private network. This function is not available for operators using the Baicelss CloudCore EPC. The feature allows an operator with a local EPC to enable or disable the Allocation and Retention Priority (ARP) function for this eNB. ARP prioritizes traffic services assigned a Guaranteed Bit Rate (GBR). Typically, ARP is considered only when a new

bearer (subscriber) attempts to attach. If the eNB is out of resources, the attachment request will be denied until resources are available.

The goal of this feature is ensure proper Qos for in-progress sessions by rejecting radio bearer requests when they cannot be accommodated, e.g., when the totol uplink GBR bandwidth exceeds the *UL GBR Acceptance Threshold* or the total number of GBR bearers exceeds the *Maximum Number of GBR Bearers*. The thresholds defined in this sub-menu determined how much of the eNB's resources can be allocated in the uplink and in the downlink.

1. Click "**Cell Access Control Settings**" to display the cell access control configuration parameter, which descriptions are given in Table 8-25.

   Table 8-25 Cell Access Control Parameter Description

Parameter	Description
ARP	Enable or disable the ARP function.
UL GBR Acceptance Threshold	Uplink GBR acceptance threshold. Range is 0 to 10000Mbps.
DL GBR Acceptance Threshold	Downlink GBR acceptance threshold. Range is 0 to 10000Mbps.
Maximum Number of GBR Bearers	The maximum number of GBR bearers.

2. Click "**Save**" to complete the cell access control setting.

8.5.16 Interference Detection Parameters

Using this menu you can enable/disable the Interface Detection feature to trigger an alarm notification when the eNB reaches a set of configured thresholds. The eNB will calculate UL and DL path loss based on Reference Signal (RS) power, Signal-to-Noise Ratio (SNR), and other measurements. It compares the path loss data between UL and DL, and if there is a significant difference (in dB) for a specified period of time, it is likely due to UL interface. If the thresholds are met, the eNB reports the interference alarm (ID 11224) to the OMC.

1. Click “**Interference Detection Parameters**” to display the interference detection configuration parameter, which descriptions are given in Table 8-26.

Table 8-26 Interference Detection Parameter Description

Parameter	Description
Interference Detection	Enable or disable the interference detection switch.
Detect Threshold	Interference detection threshold, based on the amount of difference, in dB, between UL and DL path loss.
Alarm Threshold	Alarm trigger threshold, based on the percentage of all UEs passing traffic that are meeting the detection threshold of the amount of time specified in the Alarm Period filed.
Alarm Period	The minimum period of time that the interference detection threshold is sustained before the alarm is triggered.

2. Click “**Save**” to complete the interference detection setting.

8.5.17 Multi Network Element

If you have multiple network elements providing the same service, use this function to bind the eNB to:

- A specific S1-User path (e.g., operator has local EPC as well as Cloudcore EPC)
- An X2 interface (eNB to eNB handover scenarios)
- A Tr-069 interface (multiple ACS servers)

1. Click “**Multi Network Element**” to display the multi network element configuration parameter, which descriptions are given in Table 8-27.

Table 8-27 Multi Network Element Parameter Description

Parameter	Description
S1-U Binding	Select the binding interface for S1 user plane.

Parameter	Description
X2-C Binding	Select the control plane and user traffic binding interface for X2 control plane.
X2-U Binding	Select the binding interface for X2 user plane.
tr069 Binding	Select the binding interface for Tr-069 plane.

2. Click “**Save**” to complete the multi network element setting.

8.5.18 SSH Setting

Enable the Secure Shell (SSH) setting for a secure, encrypted connection to the eNB from a remote location. If SSH is disabled, you will not able to SSH into the eNB remotely.

1. Click “**SSH Setting**” to display the SSH switch parameters.
2. Select whether enable the SSH function.
3. Click “**Save**” to complete the SSH switch setting.

8.5.19 Cell Barred Info Setting

A barred cell is a type of access control, where UEs of a certain priority level may not be allowed to attach to the eNB due to congestion. An Access Class between 0-15 is embedded in the user SIM card as a way to prioritize user traffic for a period of time. The restricted access to the eNB is not a permanent blockage.

This menu is used to enable/disable barring of 0-15 classes, and enter time periods for each. The time determines how long the eNB is barred from being accessed bu any UEs with a SIM access class that has been enabled for barring.

“MO-Signaling” refers to Mobile Originated Signaling, i.e., when a UE requests access to the eNB. “MO-Data” refers to Mobile Originated Data, meaning actual user traffic.

The cell barring factor for “MO-Signaling” and “MO-Data” determines if a UE needs to treat a cell as barred or not. The barring factor can be a value between 0 – 0.95 in increments of 0.05. The barring time determines for how long the cell is barred from

access.

1. Click "**Cell Barred Info**" to display the cell barred configuration parameter, which descriptions are given in Table 8-28.

Table 8-28 Cell Barred Info Parameter Description

Parameter	Description
Cell barred	Enable or disable the cell barred function.
Barring for emergency	Enable or disable the emergency barring function. Default is disable.
Barring for AC 11 MO-Signalling	Enable or disable the AC 11 calling signaling barring function.
Barring for AC 12 MO-Signalling	Enable or disable the AC 12 calling signaling barring function.
Barring for AC 13 MO-Signalling	Enable or disable the AC 13 calling signaling barring function.
Barring for AC 14 MO-Signalling	Enable or disable the AC 14 calling signaling barring function.
Barring for AC 15 MO-Signalling	Enable or disable the AC 15 calling signaling barring function.
Barring factor for MO-Signalling	The barring factor for calling signaling.
Barring time for MO-Signalling	The barring time for calling signaling.
Barring for AC 11 MO-Data	Enable or disable the AC 11 calling data barring function.
Barring for AC 12 MO-Data	Enable or disable the AC 12 calling data barring function.
Barring for AC 13 MO-Data	Enable or disable the AC 13 calling data barring function.

Parameter	Description
Barring for AC 14 MO-Data	Enable or disable the AC 14 calling data barring function.
Barring for AC 15 MO-Data	Enable or disable the AC 15 calling data barring function.
Barring factor for MO-Data	The barring factor for calling data.
Barring time for MO-Data	The barring time for calling data.

2. Click "**Save**" to complete the cell barred info setting.

8.5.20 Carrier Control

Only when the dual carrier function license is imported, this menu displays.

The *Carrier Control* menu is used to change the carrier mode. You can set the eNB to run as either a single carrier or two separate carriers using Dual Carrier (DC)/split mode. In single carrier mode only Cell 1 will operate.

1. Click "**Carrier Control**" to display the carrier control parameters.
2. Select single carrier or dual carriers.
3. Click "**Save**" to complete the carrier control setting.

   The eNB must be performed a warm **reboot** for the change to take effort.

8.5.21 LB Settings

Only when the dual carrier function license is imported, this menu displays.

1. Click "**LB Settings**" to display the load balance configuration parameter, which descriptions are given in Table 8-29.

Table 8-29 Load Balance Parameter Description

Parameter	Description
LB Switch	Enable or disable the load balance function.
LB Type	Select how to trigger the load balance function.

2. Click “**Save**” to complete the load balance setting.

8.5.22 SCTP Port

1. Click “**SCTP Port**” to display the SCTP port configuration parameter.
2. Set the SCTP number.
3. Click “**Save**” to complete the SCTP port setting

8.5.23 MME Port

1. Click “MME **Port**” to display the MME port configuration parameter.
2. Set the MME number.
3. Click “**Save**” to complete the MME port setting

8.5.24 Periodic Upload Log Setting

1. Click “**Periodic Upload Log Setting**” to display the upload log configuration parameter, which descriptions are given in Table 8-30.

Table 8-30 Periodic Upload Log Parameter Description

Parameter	Description
Log UpLoad	Whether the log upload function. When the function is enabled, the eNB will back up logs periodically.
Upload URL	If enabled the function, input the URL.

Parameter	Description
Upload Period	If enabled the function, set the upload period.

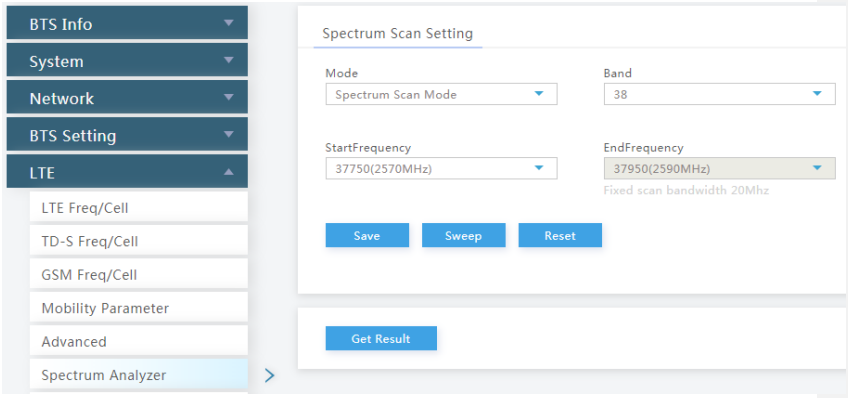
2. Click “**Save**” to complete the periodic upload log setting

8.6 Configure Spectrum Analyzer

The *Spectrum Analyzer* feature helps you to see what is happening in the RF spectrum. It may be used to analyze signal amplitude (strength) as is varies by signal frequency on the uplink. You can use this information to determine the best frequency to use and to identify where there may be interference. Frequency scanning encompasses both frequency and time information. The scan looks at the uplink data within a configured frequency range for up to 20 MHz at a time.

1. Select “**LTE > Spectrum Analyzer**” to enter the spectrum analyzer configuration page, as shown in Figure 8-4.

Figure 8-4 Spectrum Analyzer Settings



2. Input the spectrum analyzer configuration parameters, as shown in Table 8-31.

Table 8-31 Spectrum Analyzer Parameter Description

Parameter	Descriptions

Parameter	Descriptions
Mode	The eNB supports two types of spectrum scan mode. • Normal Mode • Spectrum Scan Mode If "**Normal Mode**" is selected, no other parameter needs to be configured. If "**Spectrum Scan Mode**" is selected," the following parameters need to be configured.
Band	Select the operation band, assigned automatically.
StartFrequency	The start frequency for spectrum san.
EndFrequency	The end frequency for spectrum san.

3. Click "**Save and Sweep**" to start the spectrum analyzer.

   Caution: The frequency scan operation will interrupt the current service, please run carefully.

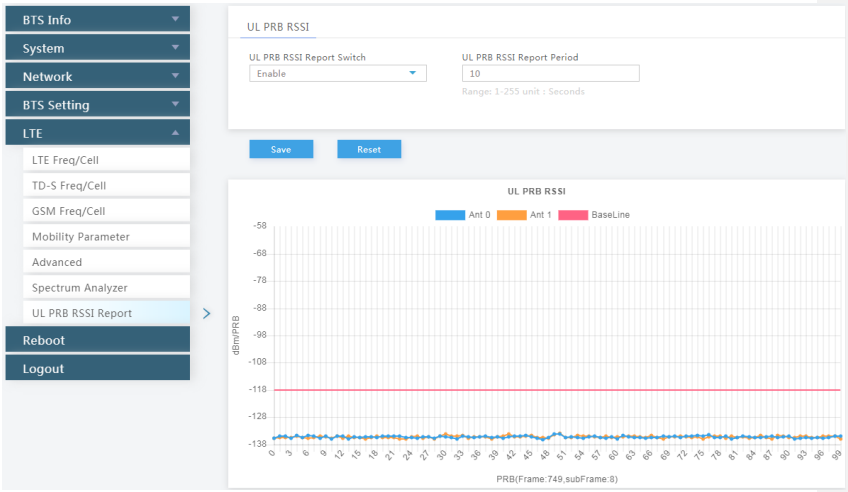
   Click "**Get Result**" to display the result of the spectrum analyzer.

8.7 Configure UL PRB RSSI

The UL Physical Resource Block (PRB) Received Signal Strength Indicator (RSSI) Report feature may be used when you think you have an interference issue. RSSI measures the total received wideband power, including noise. When you run this report, the eNB looks for UE subframes not being used (no PRBs assigned, no traffic) then takes the RSSI measurement.

1. Select "**LTE > UL PRB RSSI Report**" to enter the UL PRB RSSI setting page, as shown in Figure 8-5.

Figure 8-5 UL PRB RSSI Setting



2. Input the report parameters, as shown in Table 8-32.

Table 8-32 UL PRB RSSI Configuration Parameter Description

Parameter	Descriptions
UL PRB RSSI Report Switch	Whether enable the switch.
UL PRB RSSI Report Period	Set the report period.

3. Click "**Save and Sweep**" to complete the UL PRB RSSI report setting.

The eNB will report results according to the period. The report will display a graph in real-time at the bottom of the window, showing the total UL RSSI (in dBm) along the y-axis for each PRB along the x-axis. Since there are multiple antenna elements, the Baicells eNB reports each RF chain – ANT1 and ANT 2. Only 20MHz of bandwidth can be detected at one time.

Appendix A **Terminology & Acronym**

Acronym	Full Name
AGL	Above Ground Level
ARP	Address Resolution Protocol
CBRS	Citizen Broadband Radio Service
CBRD	CBRS Service Device
CHAP	Challenge Handshake Authentication Protocol
CPI	Certified Professional Installer
CSFB	Circuit Switched Fallback
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
ECI	E-UTRAN Cell Identity
EIRP	Effective Isotropic Radiated Power
ESP	Encapsulating Security Payload
GBR	Guaranteed Bit Rate
GPS	Global Positioning System
ICIC	Inter-cell Interference Coordination
IKE	Internet Key Exchange

MME	Mobility Management Entity
NAS	Non-Access Stratum
NTP	Network Time Protocol
PAP	Password Authentication Protocol
PCI	Physical Cell Identifier
PLMN	Public Land Mobile Network
PPPOE	Point to Point Protocol over Ethernet
PRACH	Physical Random Access Channel
PRB	Physical Resource Block
PUCCH	Physical Uplink Control Channel
PUSCH	Physical Uplink Shared Channel
RRC	Radio Resource Control
RSRP	Reference Signal Receiving Power
RSSI	Received Signal Strength Indicator
SAS	Spectrum Access System
SFR	Single Frequency Reuse
SON	Self-Organized Network
SNR	Signal-to-Noise Ratio
SSH	Secure Shel

TAC	Tracking Area Code