NeutrinoE224 Pro

Indoor 2x125mW eNB

User Manual

for BaiBLQ_5.1.x-01

Document version: 04

About This Document

This document introduces NeutrinoE224 Pro TDD/FDD indoor base station, and guides users to install and quick setup for the base station, which is used for software version BaiBLQ_5.1.x-01.

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Revision Record

Date	Version	Description
20 Aug., 2022	01	Initial Release.
22 March, 2023	02	Modify the password of the admin.
2 June, 2023	03	Added the “Initial IPsec tunnel” parameter to the Certificate menu.
6 Dec, 2023	04	Modify the description of dip switch for antenna.

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1. Product Overview

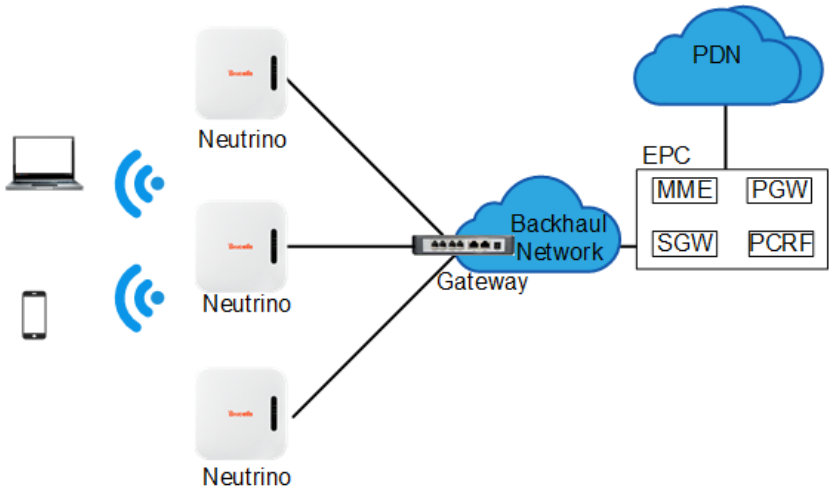
1.1 Introduction

Baicells NeutrinoE224 Pro is an indoor base station based on LTE TDD/FDD technology, which supports broadband data access. It supports the backbone network through family broadband way, providing various data service transformation and transmission to realize the wireless coverage of indoor.

The NeutrinoE224 Pro makes use of the current transmission resources to reduce the operator investment, construct the LTE network with low cost, and enhance the indoor coverage. It can be widely used in telecom operators and broadband operators to promote the user experience in family, shopping mall, and so on.

The network structure of NeutrinoE224 Pro access to LTE network is shown in Figure 1-1.

Figure 1-1 Network Structure



1.2 Highlights

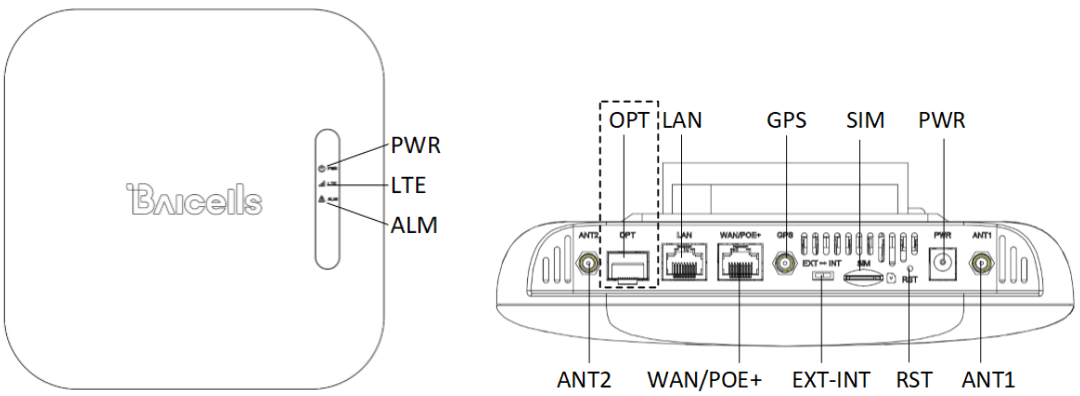
- Adopt the integration design of baseband and RF.
- Based on 3GPP LTE TDD/FDD technology; provide high speed data service.
- Support 5MHz/10MHz/15MHz/20MHz operation bandwidth.
- 32 RRC connected users

- Lower power consumption to reduce OPEX
- Fast networking, plug and play and flexible deployment.
- Integration as required, provide accurate coverage and improved network capacity rapidly.
- Integrated high gain internal antenna.
- Built-in DHCP Server, DNS Client and NAT functionality, providing a strong high speed routing ability.
- Rich security services to provide timely protection against potential security risks and illegal intrusion.
- Adopt Web management, convenient and simple.
- Support perfect network management function, which implement the management, monitor and maintenance.
- Small and exquisite, user friendly LED indicators are easy to monitor device status.

1.3 Appearance

The NeutrinoE224 Pro base station appearance and interfaces are shown in Figure 1-2.

Figure 1-2 NeutrinoE224 Pro Appearance and Interfaces



The NeutrinoE224 Pro interfaces are described in Table 1-1.

Table 1-1 NeutrinoE224 Pro Interface Description

Interface	Description
OPT	(Optional) Optical fiber interface, used for external transmission network
LAN	Gigabit Ethernet interface, used for the initial configuration or debugging
GPS	(Optional) external GPS antenna, SMA female.
SIM	SIM card slot
PWR	12VDC power supply interface
ANT2	(Reserved) external antenna 2
WAN/POE+	Gigabit Ethernet and PoE+ interface, used for external transmission network and power supply.
EXT-INT	Dip switch for built-in antenna or external antenna, set according to scenarios: - EXT: external antenna - INT: built-in antenna
RST	Power reset button
ANT1	(Optional) external antenna 1

NOTE: Some models support OPT interface and WAN/PoE+ interface simultaneously. Some models only supports WAN/PoE+ interface, refer to the actual device.

The NeutrinoE224 Pro LED indicators are described in Table 1-2.

Table 1-2 NeutrinoE224 Pro LED Indicators

Color	Status	Description
PWR	Steady on	The device has powered on.
LTE	Fast flash	LTE traffic is transmitting.
	Slow flash	The cell has been activated.
ALM	Steady on	Alarm that strong interference cell exists around the cell.
	Fast flash	S1 alarm.
	Slow flash	Other alarms.

1.4 Technical Specification

1.4.1 Technology

Item	Description
Standard	LTE TDD/FDD RAN (3GPP R15 compliant)
TDD UL/DL Configuration	1, 2 (with Special Subframe Configuration 7)
Frequency Band [a]	Refer to the device label
Channel Bandwidth	Band1/2/3/7/40/41: 5/10/15/20 MHz Band5/8: 5/10 MHz
Multiplexing	MIMO: 2x2 (DL)
Security	Radio: SNOW 3G/AES-128/ZUC Backhaul: IPsec (X.509 AES-128, AES-256, SHA-128, SHA-256)

[a] Different models support different frequency bands.

1.4.2 Interface

Item	Description
Ethernet Interface	One RJ-45 Ethernet backhaul interface (1 GE) and one RJ-45 local Mgmt. interface (1 GE)
Power Supply	12VDC, AC adaptor (multiple standards optional), PoE+, comply with IEEE 802.3at standard
Protocols Used	IPv4/IPv6 (Dual Stack), UDP, TCP, ICMP, NTP, SSH, IPsec, TR-069, HTTP/HTTPS, 1588v2, DHCP
Network Management	IPv4/IPv6, HTTP/HTTPS, TR-069, SSH, Embedded EPC
VLAN/VxLAN	802.1Q/VxLAN
LED Indicators	3 x status LED PWR/LTE/ALM

1.4.3 Performance

Item	Description
Peak Data Rate-in TDD mode	20 MHz: • SA1: DL 80 Mbps, UL 20 Mbps • SA2: DL 110 Mbps, UL 10 Mbps 10MHz: • SA1: DL 40 Mbps, UL 7 Mbps • SA2: DL 55 Mbps, UL 5 Mbps
Peak Data Rate-in FDD mode	20MHz: DL 150Mbps, UL 50Mbps 10MHz: DL 75Mbps, UL 25Mbps
User Capacity	32 RRC connected users

Item	Description
Latency	30 milliseconds
Receive Sensitivity	Band1/3/5/8/40: -101dBm Band41: -100dBm
Modulation	MCS0 (QPSK) to MCS28 (64QAM) DL: QPSK, 16QAM, 64QAM UL: QPSK, 16QAM
Transmit Power Range	0 to 21 dBm per channel (combined +24dBm, configurable) (1 dB interval)
Quality of Service	Nine-level priority indicated by QoS Class Identifiers (QCI)
ARQ/HARQ	Supported
Synchronization	GPS, 1588v2, network listening (NL)

NOTE: The test method of receiving sensitivity is proposed by the 3GPP TS 36.104, which is based on 5MHz bandwidth, FRC A1-3 in Annex A.1 (QPSK, R=1/3, 25RB) standard.

1.4.4 Features

Item	Description
Voice	VoLTE, Circuit Switched Fallback (CSFB) to GSM and UTRAN
Inter-RAT Mobility	To GSM, UTRAN and 5G NSA/SA
SON	Self-Organizing Network • Automatic setup • Automatic Neighbor Relation (ANR) • PCI confliction detection
EPC	HaloB (Embedded EPC)
Traffic Offload	Local breakout
Maintenance	• Local/Remote Web maintenance • Online status management

Item	Description
	• Performance statistics • Fault management • Local/Remote software upgrade • Logging • Connectivity diagnosis • Automatic start and configuration • Alarm reporting • User information tracing

1.4.5 Link Budget

Item	Description
RF Antenna	Built-in Omni Antenna • Horizontal Beamwidth 360° • Vertical Beamwidth 40°±5@Band40/41, 45°±5@ Band1/3/5/8 • Polarization: Vertical
RF Antenna Gain	5dBi@Band7/40/41 4 dBi @Band1/3 2 dBi @Band5/8
Maximum EIRP	28 dBm @Band1/3 26 dBm @Band5/8 29 dBm @Band7/40/41
Power Control	UL Open-loop/Closed-loop Power Control, DL Power Allocation (3GPP TS 36.213 compliant)

1.4.6 Physical

Item	Description
MTBF	≥ 150000 hours
MTTR	≤ 1 hour
Operating Temperature	23°F to 113°F / -5°C to 45°C
Storage Temperature	14°F to 122°F / -10°C to 50°C
Humidity	5% to 95% RH
Atmospheric Pressure	70 kPa to 106 kPa
Power Consumption	Typical 11.25W, maximum 15W
Weight	1.3 lbs / 570g
Dimensions (HxWxD)	8.3 x 8.3 x 1.9 inches 210 x 210 x 45 millimeters
Installation	Ceiling or wall mount, or desktop

2. Install Base Station

To get the signal coverage effect best, please place the Neutrino base station in an unobstructed space.

The NeutrinoE224 Pro base station can be installed on ceiling, wall or place on the desktop. If it is placed on the desktop, no installation steps are required, connect the cables directly after placed it. The following separately introduces the tools, attentions and detailed installation steps when the NeutrinoE224 Pro is installed on ceiling or on wall.

NOTE: Before installation, make sure the wiring has been completed on installation site.

2.1 Packing List

Before opening the box, make sure the package is in good condition, undamaged and not wet. During the unpacking, avoid potential damaging impacts from hits or excessive force.

Once unpacked, check the contents to see if they are consistent with the packing list.

2.2 Installation Preparation

The marker pen and percussion drill will be used during the installation process. The screws and expansion bolts are shipped with the device.

2.3 Install on Ceiling

The NeutrinoE224 Pro can be installed on ceiling.

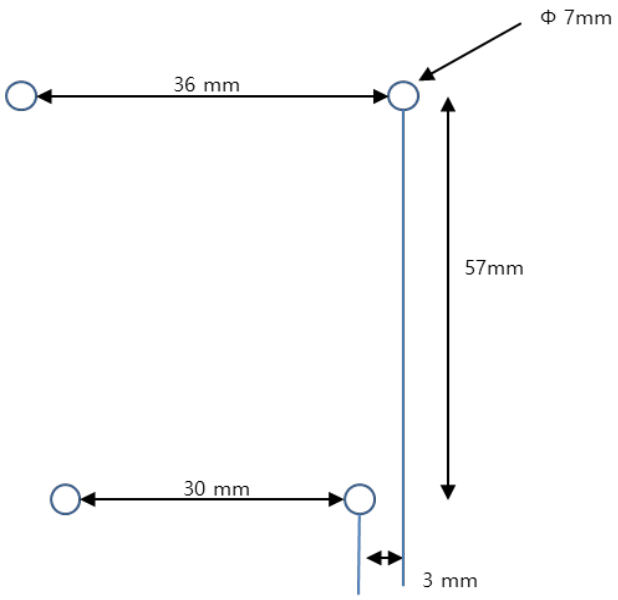
Attention:

- The thickness of ceiling is not less than 18mm, and bearing weight is larger than 5kg. If the strength is not suitable, the device maybe fall off.
- If the ceiling is made of weak strength materials, such as gypsum ceiling, this installation method is not recommended. Because of the environment restriction this installation method must be used, please add one layer better panel under screws to make sure the device is fastness.

The installation steps are as follows:

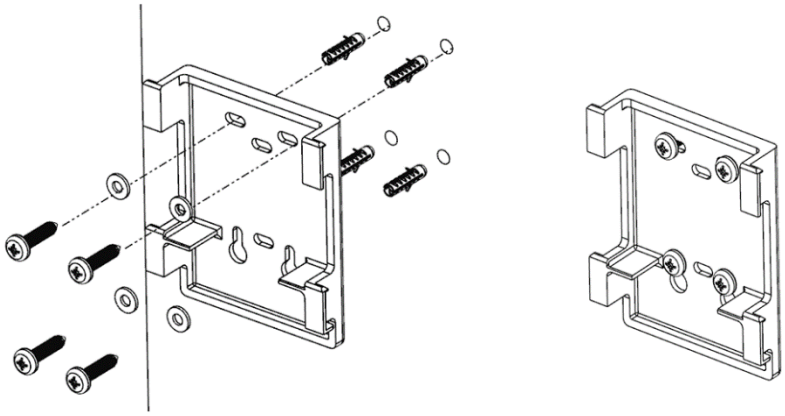
1. Take down a selected ceiling.

2. Place the bracket on center of the ceiling and mark the holes position with a marker pen.

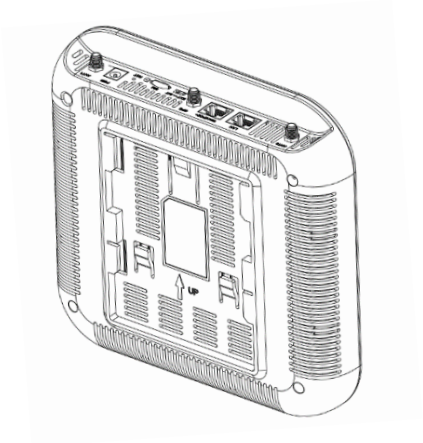


3. According to the marked position, drill four holes.

4. Using expansion bolt to fix the installation bracket on ceiling and tighten screws.



5. Slide the base station according to the direction on the bracket to complete the base station installation.



2.4 Install on Wall

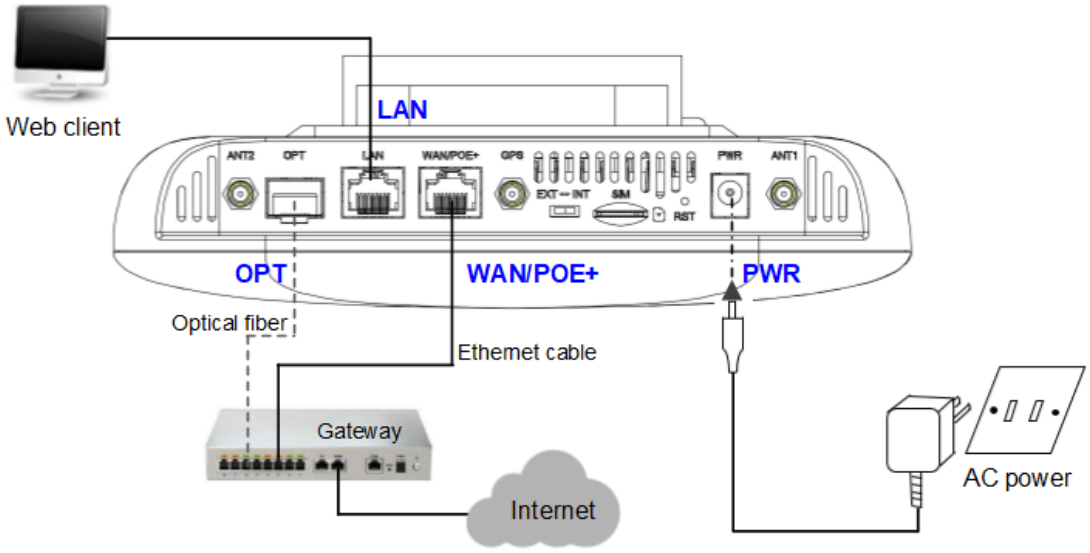
The NeutrinoE224 can be installed on wall, the installation steps is the same as installation on ceiling.

NOTE: The arrow on the back of the eNodeB must be upward.

2.5 Connect Cable

1. Connect power adaptor to **PWR** port and the other end connects to AC power.
2. Connect Ethernet cable to **LAN** port and the other end connects to the web client.
3. Connect Ethernet cable to **WAN** port and the other end connects to the gateway device.
4. (Optional) If the eNB supports the optical port, connect optical fiber to **OPT** port and the other end connects to the gateway device.

   NOTE: Some eNB models do not support OPT interface, refer to the actual device.



NOTE: If PoE+ power supply is used, connect the WAN/PoE+ port to the PoE port of the PoE adapter first, and then connect the LAN port of the PoE adapter to the switch.

2.6 Power On

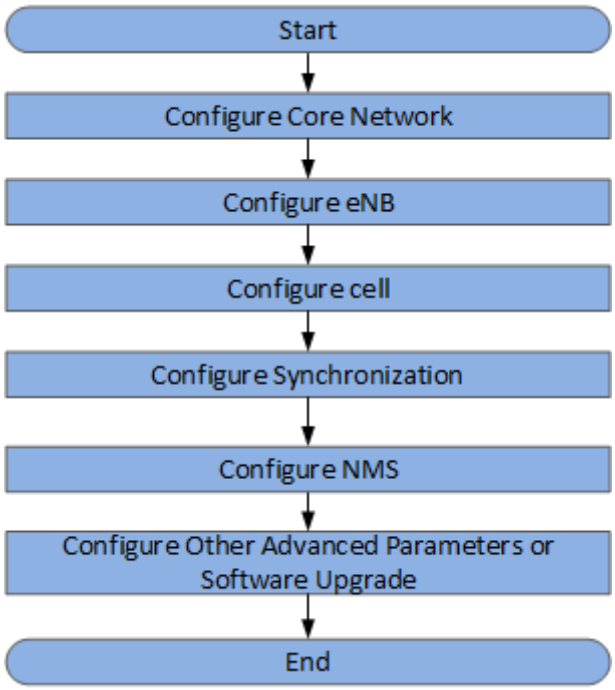
Power on the eNB, and wait a few minutes while the eNB boots up. Per the previous Table 1-2, check that the LED indicators are lighting as expected.

3. Configuration Overview

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 Operation 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 3-1.

Figure 3-1 Initial eNB Configuration Flow



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 transmission parameters, wireless parameters, operation and maintenance parameters, and software version, etc.

4. Login Web Client

4.1 Web Client Environmental Requirements

Table 4-1 describes the requirements for the client computer.

Table 4-1 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
Operating system	• Microsoft: Windows7 or Windows 10 or higher • Mac: MacOSX10.5 or higher
Screen resolution	Above 1024 x 768
Browser	• Chrome • Microsoft Edge, Internet Explorer • Firefox

4.2 Connect Web Client to eNB

Connect the Ethernet interface of the computer to the ETH interface of the eNB through the Ethernet cable.

4.3 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 10 as an example:

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

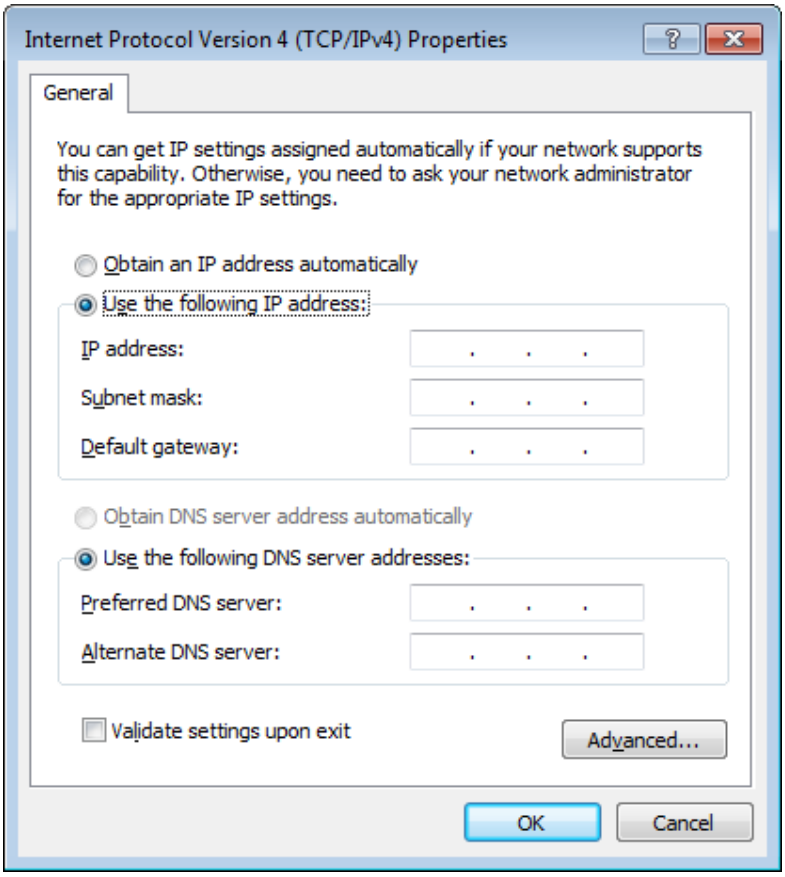
pops up.

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 4-1.

Figure 4-1 Internet Protocol Version (TCP/IPV4)



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 ETH interface of the base station uses the IP address of 192.168.150.1, others should avoid using this address.

- Subnet mask: 255.255.255.0

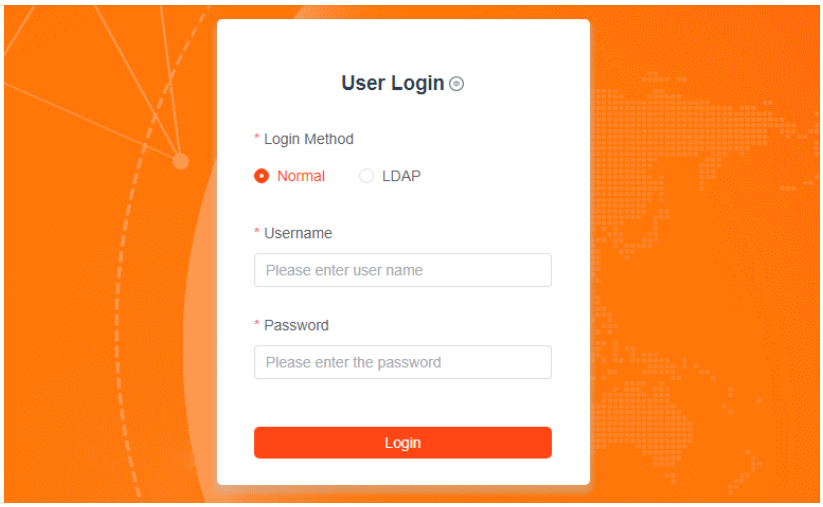
- Default gateway: 192.168.150.1

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.

4.4 GUI Login

1. Open a web browser, type in HTTPS://192.168.150.1, then click “Enter”, as shown in Figure 4-2.

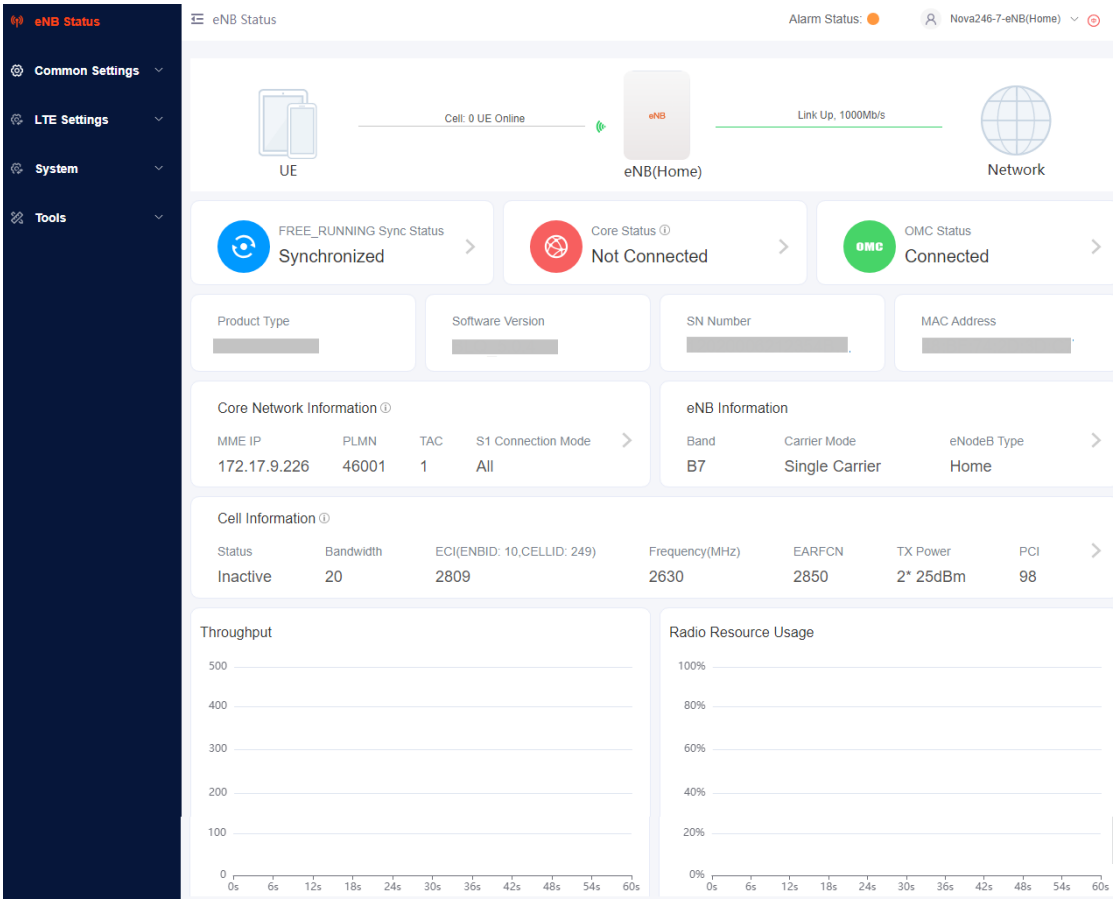
Figure 4-2 GUI Login



2. Input username, password, and click “**Login**”. The homepage is given in Figure 4-3.

   The default username is *admin*. Each eNB has an exclusive default password, which is formatted as *eNB@a*b*c*d**, where * represents the last four digits of the eNB's Serial Number (SN). For example, if the last four digits of the eNB's SN are *1234*, then the default password for that eNB would be *eNB@a1b2c3d4*.

Figure 4-3 GUI Homepage

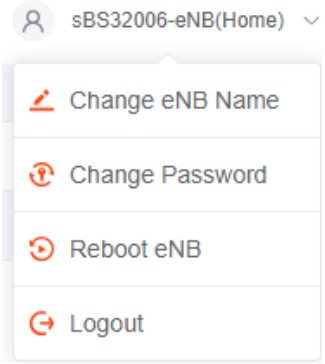


NOTE: The information may vary by product type or software version.

The homepage displays the navigation pane on the left, which shows the window for the first menu: **eNB Status**. This window is like a dashboard for the eNB.

The system operation menu is located in the upper-right corner of the homepage. Click the *product name* to pop up the system menu, as shown in Figure 4-4, which offers *Change eNB Name*, *Change Password*, *Reboot eNB*, and *Logout* sub menu.

Figure 4-4 System Menu

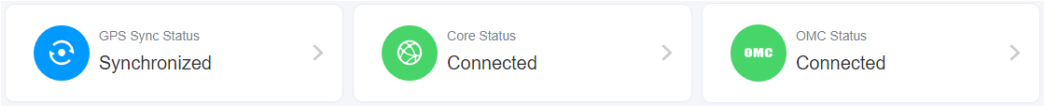


The home page consists of following parts.

- External connection status information

  This part shows the status information of synchronization, core network, and OMC connection, as shown in Figure 4-5.

  Figure 4-5 External Connection Status Information



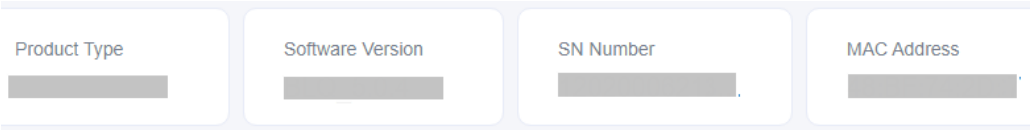
  - Click **>** on the right of Sync status, go to "**Common Settings > Sync Setting**" the menu. For more configuration information, refers to "6.2 Synchronization Setting".
  - Click **>** on the right of Core status, go to "**Common Settings > Network Settings > Core Network**" the menu. For more configuration information, refers to "6.1.4 Configure Core Network".
  - Click **>** on the right of OMC status, go to "**Common Settings > Management Server**" the menu. For more configuration information, refers to "6.4 Management Server".

  When you complete the setting, click **Back** of the browser, go back to the homepage.

- eNB information

  This part shows the Product Type, Software Version, SN Number, and MAC Address, as shown in Figure 4-6.

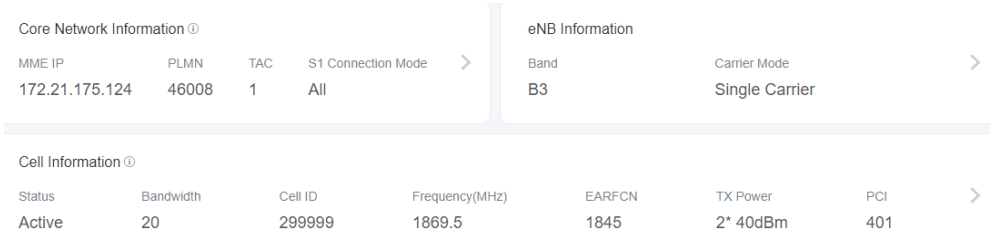
  Figure 4-6 eNB Information



- Basic setting

Before starting up the eNB, some basic parameters must be configured, including Core Network Information, eNB Information, and Cell Information, as shown in Figure 4-7.

Figure 4-7 Basic Setting

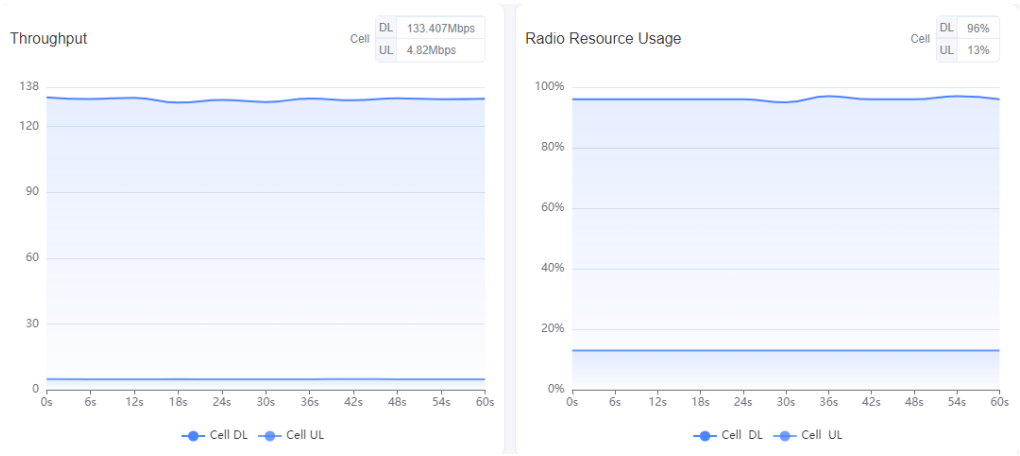


Click **>** to pop up corresponding configuration dialog box. For more information, refer to “5 Basic Setting”.

- Chart

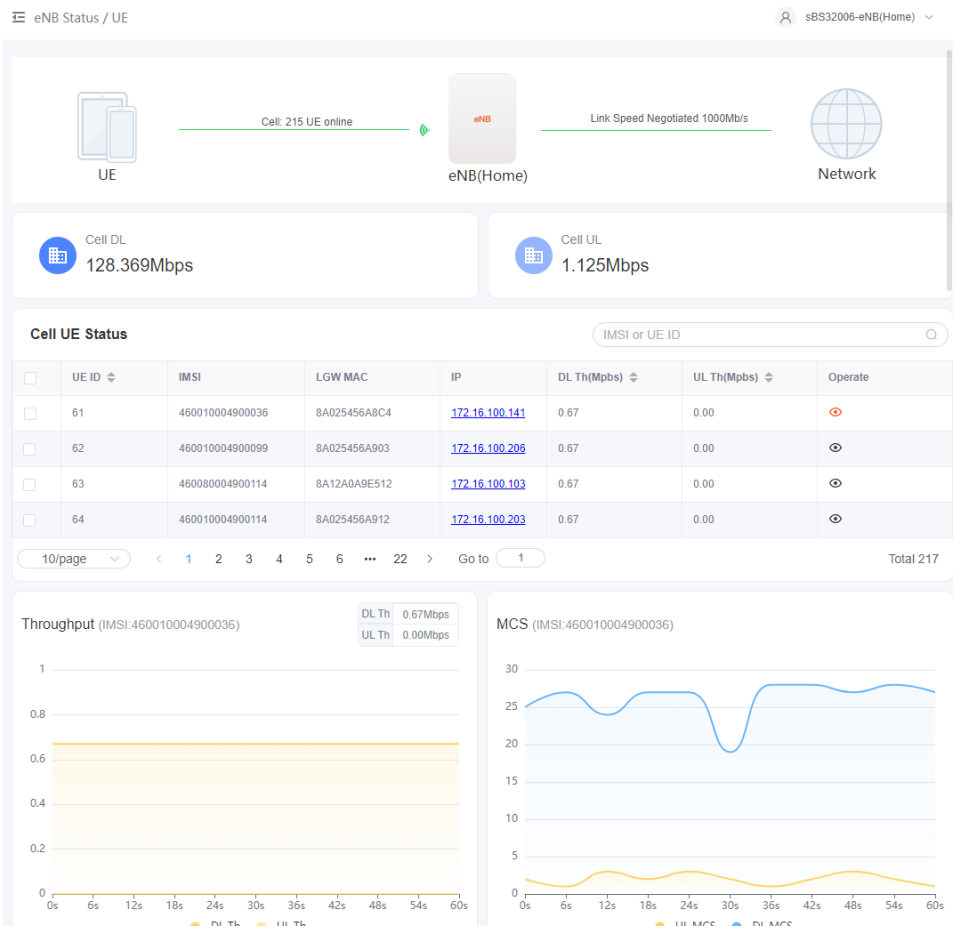
  This part shows the throughput and Radio Resource Usage of the cell, as shown in Figure 4-8.

Figure 4-8 Throughput and Radio Resource Usage Chart



The top of the homepage shows the icons of the UE, eNB and Network, click “UE” the icon to show corresponding settings and state of registered UEs, as shown in Figure 4-9.

Figure 4-9 UE Status

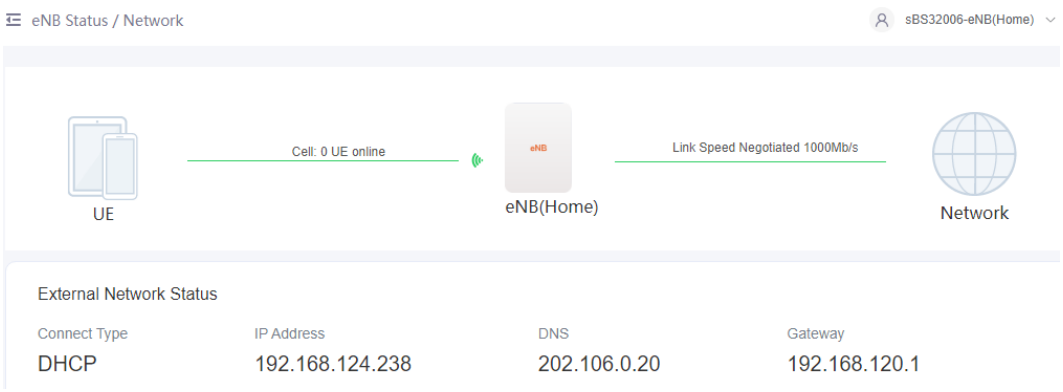


The page shows current DL/UL throughput of the cell, the UE status information.

In the UE list, the value of UE ID, IMSI, LGW MAC, IP, DL/UL throughput are displayed. Click in the column Operations, following shows the chart of this UE, including throughput, Modulation and Coding Scheme (MCS), Block Error Rate (BLER) and UL Signal to Interference plus Noise Ratio (SINR).

Click “Network” the icon to show the network information, which is shown in Figure 4-10.

Figure 4-10 Network Status



This page shows the external network status, refer to “6.1.1 Configure WAN/VLAN” for the configuration.

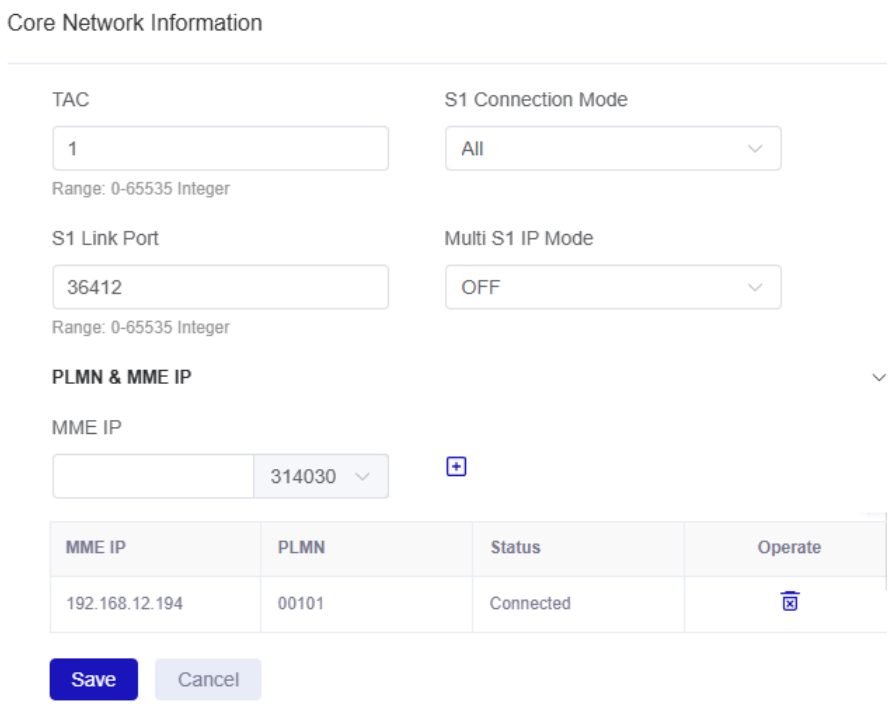
5. Basic Setting

The basic settings determine important RF parameters, as well as connectivity to Baicells CloudCore Evolved Packet Core (EPC).

- Core Network Information

  Click **>** in “Core Network Information” area to pop up the core network setting dialog box, as shown in Figure 5-1.

Figure 5-1 Core Network Setting



The parameter descriptions of the core network setting are given in Table 5-1.

Table 5-1 Core Network Parameter Description

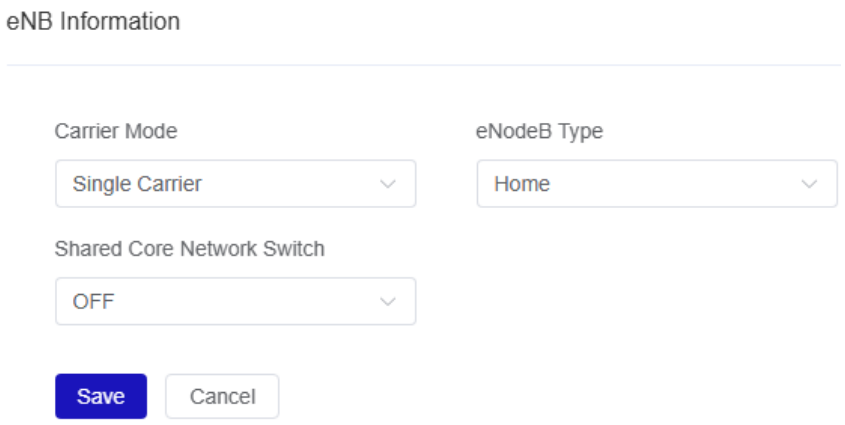
Parameter	Description
TAC	Tracking Area Code (TAC) of the cell site where the eNB resides. The TAC is used to determine the range of the paging information.

Parameter	Description
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. • All: The eNB will connect to all MMEs configured.
S1 Link Port	The port of S1 link used. Default is 36412. **NOTE**: If HaloB is set to ON, this parameter cannot be set.
Multi S1 IP Mode	Multiple IP addresses switch for S1 interface.
MME IP	IP address of the cell's associated MME, identical to the IP address of the MME at the core network side. **NOTE**: This parameter will not appear in HaloB mode.

- eNB Information

Click **>** in "eNB Information" area to pop up the eNB setting dialog box, as shown in Figure 5-2.

Figure 5-2 eNB Settings



The parameter descriptions of the eNB setting are given in Table 5-2.

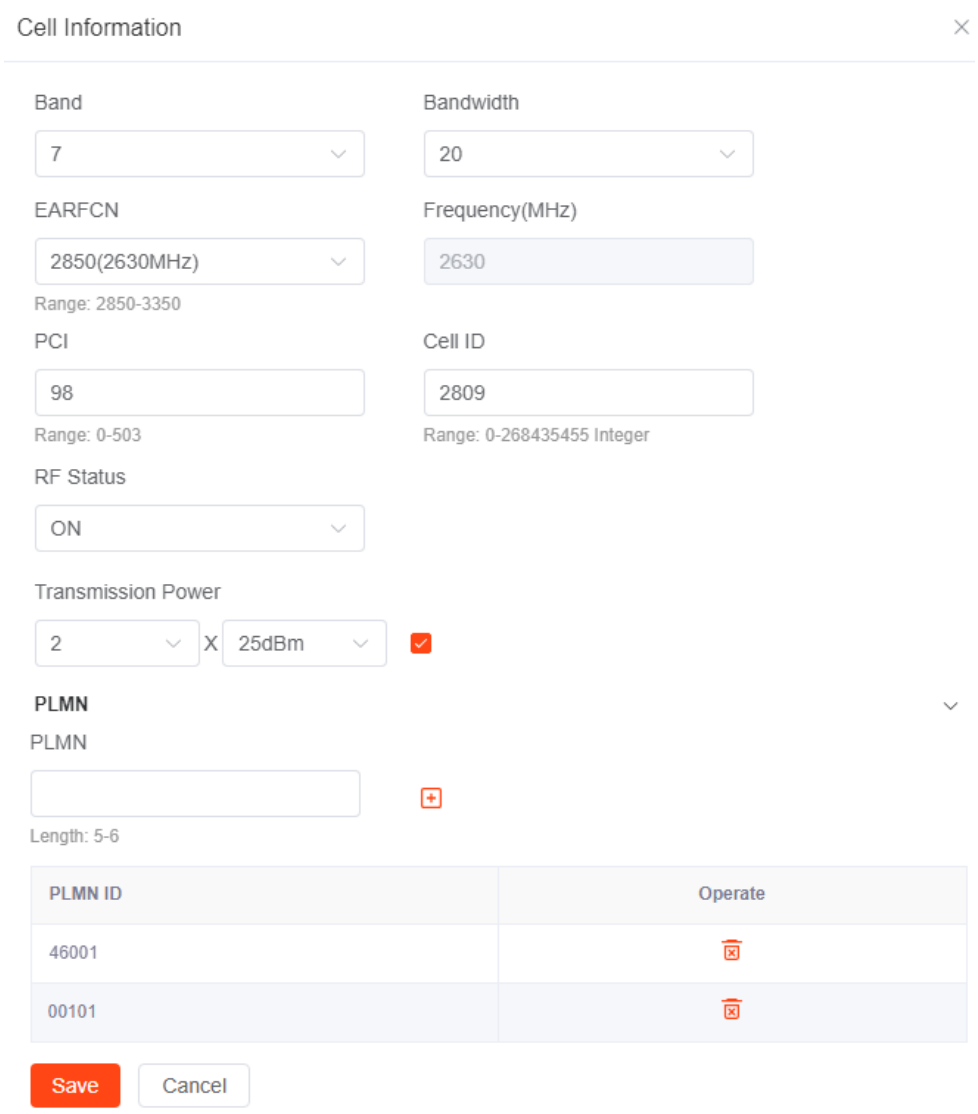
Table 5-2 eNB Setting Parameter Description

Parameter	Description
Carrier Mode	The carrier mode eNB supported. Only single carrier mode is supported.
eNodeB Type	Select the type of the eNB. • Macro • Home
Shared Core Network Switch	Shared core network switch.
Primary PLMN	When “Shared Core Network Switch” is set to “ON”, this parameter displays. PLMN ID of primary PLMN.

- Cell Information

  Click **>** in ”Cell Information” area to pop up the cell setting dialog box, as shown in Figure 5-3.

Figure 5-3 Cell Setting



The parameter descriptions of the quick setting are given in Table 5-3.

Table 5-3 Cell Setting Parameter Description

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.

Parameter	Description
	• 5MHz • 10MHz • 15MHz • 20MHz
EARFCN	The absolute radio frequency channel number, selected by the operator. Allocated by the operator.
Frequency (MHz)	The eNB's operating frequency, selected by the operator. The range depends on the base station model and country code.
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. Range from 0 to 503. **NOTE**: Under normal circumstances, 0 is not used.
Cell ID	Unique identification number for the Cell ID. The range is 0 to 268,435,455.
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.
Transmission Power	The maximum output power on each port. Must be within regulatory guidelines for the region. Range is from 0dBm to 46dBm. 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. If the check box on the right is selected, you can configure any power.

Parameter	Description
PLMN	The numerical identifier for the operator's Public Land Mobile Network (PLMN) for this cell. Must be a 5- or 6-digit number. When the PLMN ID is added, it will display in the PLMN list.

6. Common Settings

The configuration of the network interface includes the WAN, VLAN, LAN, IPsec, LGW, Core Network, and static routing.

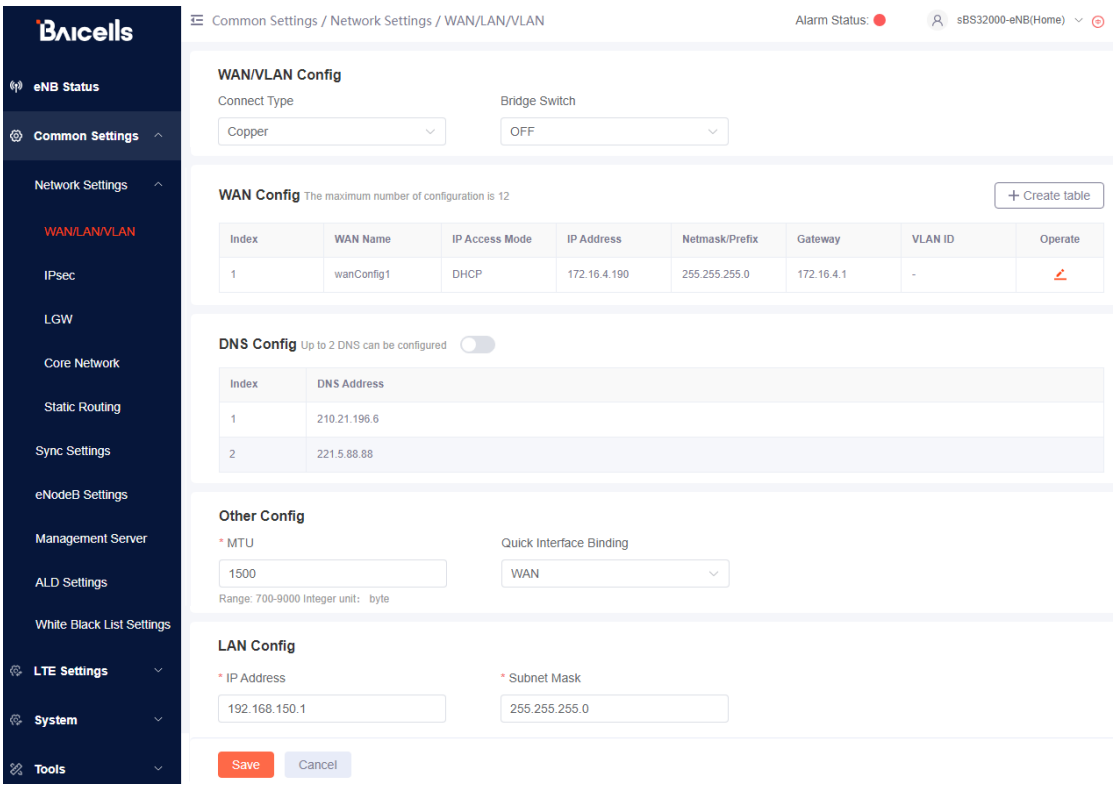
NOTE: When the LGW function is enabled and “IP Access Mode” is set to “DHCP”, if “IP Access Mod” is modified, due to the change of the MAC address, the IP address will also change at the same time. Therefore, the configuration of the static route also should be modified.

6.1 Network Setting

6.1.1 Configure WAN/VLAN

1. Select “**Common Settings > Network Setting > WAN/LAN/VLAN**” to enter the WAN interface configuration page, as shown in Figure 6-1.

Figure 6-1 Configure WAN/LAN/VLAN



This configuration page is divided into five parts: Connect Type, WAN Config, DNS Config, Other Config and LAN Config.

2. Select Connection Type.

- Copper: RJ-45 electrical interface
- Fiber: optical fiber interface

3. Select whether enable “Bridge Switch”.

   Enable the switch when the base station is operating in cascade mode or HaloD slave mode.

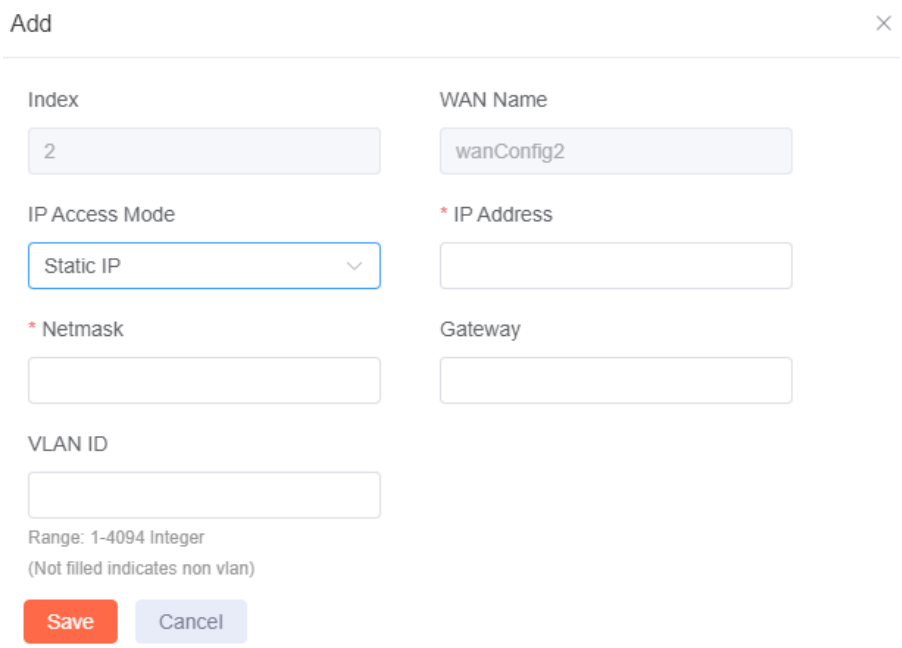
4. Configure WAN interface. Up to 12 WANs are supported.

   WAN interface is an external communication portal (Internet connection) the eNB’s NMS and the MME. The eNB’s NMS may be the Baicells Operation and maintenance center (OMC) or LTE NMS. The only option for the Interface name field is WAN. The WAN interface supports configuring multiple VLANs.

   CAUTION: The IP address of WAN interface and LAN interface cannot in the same network segment.

   a) Click “**+Create table**” to pop up the WAN configuration window, as shown in Figure 6-2.

   Figure 6-2 Add a WAN Interface



   b) Input the WAN configuration parameters, which are given in Table 6-1.

Table 6-1 WAN Interface Parameter Description

Parameter	Description
Index	The index is generated automatically.
WAN Name	The WAN name is generated automatically.
IP Access Mode	The interface protocol used by WAN interface, include: • **DHCP**: Only option 60 the parameter needs to be configured. • **PPPoE**: PPPoE authentication method, username, and password are required. • **Static IP**: IP Address, Netmask, and Gateway are required. • **IPv6 DHCP**: No other parameter is required. • **IPv6 Static IP**: IP Address, Prefix, and IPv6 Gateway are required.
IP Address	If "**IP Access Mode**" is set to "**Static IP**" or "**IPV6 Static IP**", this parameter displays. IP address of the WAN interface. If DHCP is selected, the IP address is acquired automatically.
Netmask	If "**IP Access Mode**" is set to "**Static IP**", this parameter displays. Subnet mask address of the IP address. If DHCP is selected, the IP address is acquired automatically.
Gateway	If "**IP Access Mode**" is set to "**Static IP**", this parameter displays. IP address of the default gateway. If DHCP is selected, the IP address is acquired automatically.

Parameter	Description
option60	If “**IP Access Mode**” is set to “**DHCP**”, this parameter displays. This is an identity to match with terminals to differentiate different terminals.
PPPoE Authentication	If “**IP Access Mode**” is set to “**PPPoE**”, this parameter displays. PPPoE authentication method. • chap • pap
PPPoE Username	If “**IP Access Mode**” is set to “**PPPoE**”, this parameter displays. PPPoE username.
PPPoE Password	If “**IP Access Mode**” is set to “**PPPoE**”, this parameter displays. PPPoE password.
Prefix	If set “**IP Access Mode**” to “**IPv6 Static IP**”, display this parameter. Prefix of IPv6 address for WAN interface.
IPv6 Gateway	If set “**IP Access Mode**” to “**IPv6 Static IP**”, display this parameter. The gateway of IPv6 address for WAN interface.
VLAN ID	VLAN ID. When the operator needs to transmit the data of multi types through separate channel, configure more IP addresses for WAN interface through VLAN, and assign them with different VLAN ID. Range is from 1 to 4094 integer.

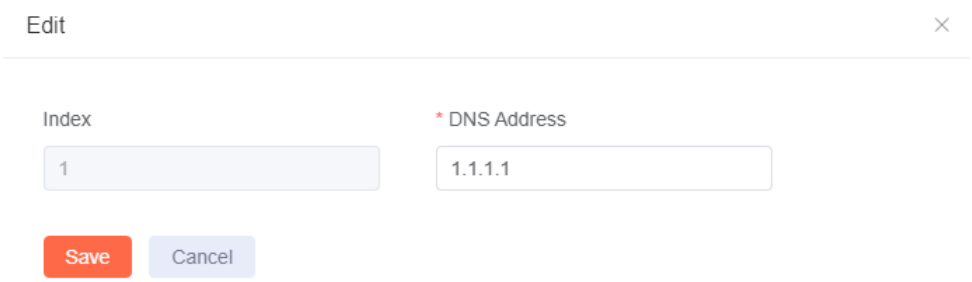
b) Click “Save” to complete configuration of WAN interface.

4. Configure DNS.

If enabling the DNS, first move the slider to right. Up to two DNS are supported.

a) Click to enter the DNS edit window, as shown in Figure 6-3.

Figure 6-3 Configure DNS



b) Input DNS configuration parameter, as shown in Table 6-2.

Table 6-2 DNS Parameter Description

Parameter	Description
Index	The index is generated automatically.
DNS Address	The IP address of the DNS.

5. Set other configuration parameters, as shown in Table 6-3.

Table 6-3 Other Configuration of WAN

Parameter	Description
MTU	Maximum transmission unit, default is 1500 bytes. Setting the right MTU for the network can help to improve the transmitted efficiency.
Quick Interface Binding	Select binding interface.

6. Configure LAN

LAN interface is the internal maintenance interface used in initialization and will no

longer be needed in normal operation. The default IP address of the LAN interface is **192.168.150.1**. In general, the initial value need not to be changed.

ATTENTION: If the IP address of LAN interface is modified, the eNB must be rebooted to make the configuration take effort. And then logging in the client using the new IP address.

6.1.2 Configure IPsec

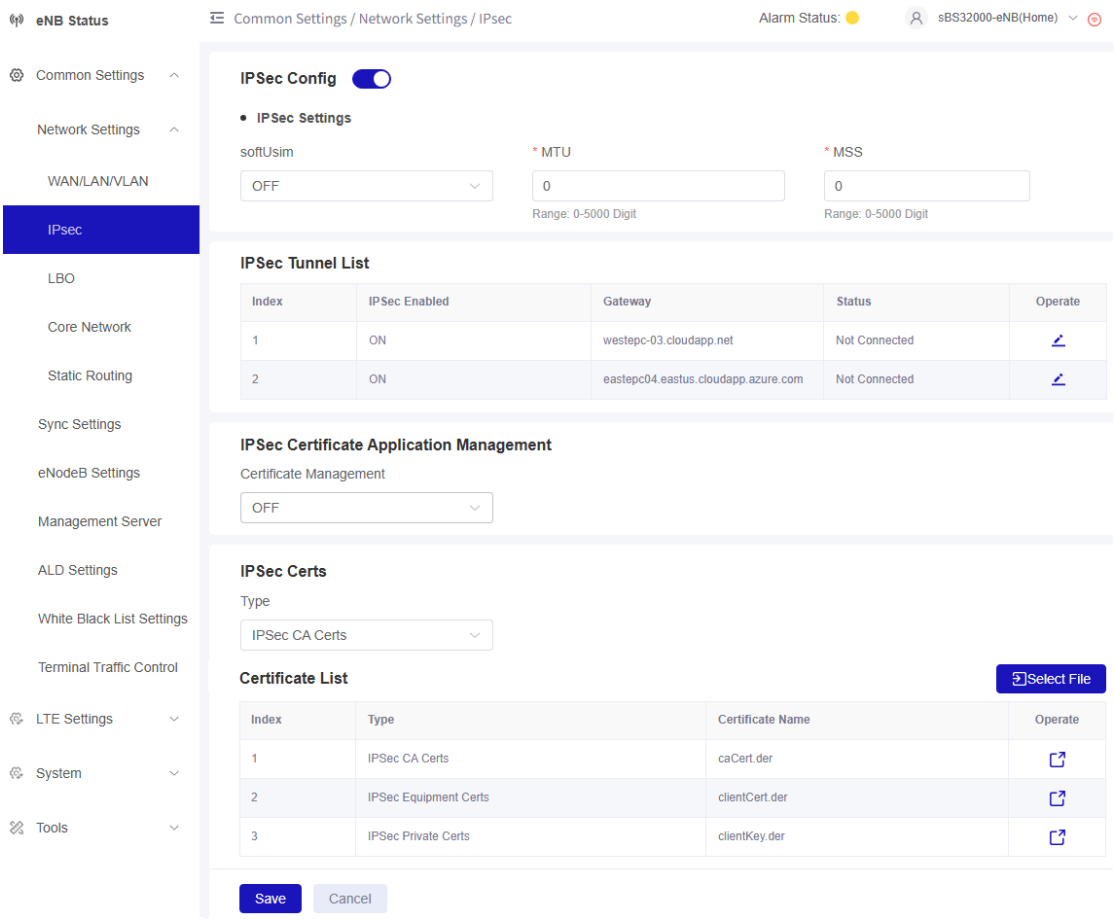
The IP Security (IPsec) interface is used to route the control plane information between the eNB and the EPC.

The security gateway (SeGW) in the network can provide security protocol in the network layer to ensure the safety for message transmission. If the operator has deployed the security gateway, the eNB needs to enable the IPsec function accordingly to establish a safe VPN channel between the eNB and the SeGW.

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

Select "**Common Settings > Network Setting > IPsec**" to enter the IPsec configuration page, as shown in Figure 6-4.

Figure 6-4 Configure IPsec



Select to enable or disable the IPsec function. Default is enabled. After enabling IPSec, the following Settings need to be made.

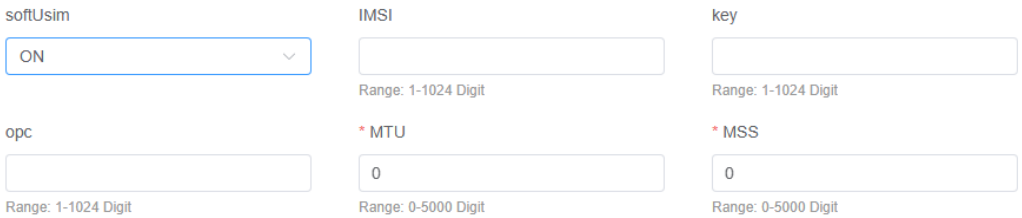
- Configure IPSec

  1. Select whether to enable “softUsim” function. Default is “OFF”.

     When the IPsec authentication is set to “eap-aka”, the parameter can be enabled. If disabled, the hard USIM will be adopted.

  2. If “softUsim” is set to “ON”, configuration parameters display, shown in Figure 6-5.

Figure 6-5 Configure Soft USIM



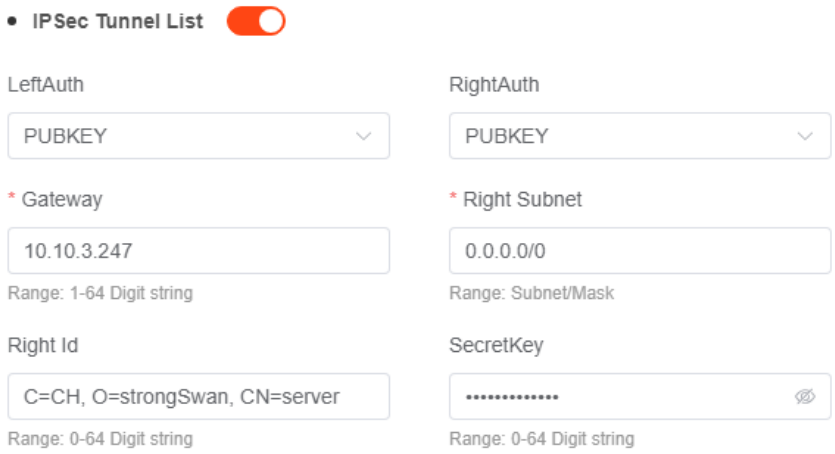
Input software USIM configuration parameters, as shown in Table 6-4.

Table 6-4 Soft USIM Configuration Parameter Description

Parameter	Description
IMSI	When "**softUsim**" is set to "**ON**", this parameter displays. IMSI number.
key	When "**softUsim**" is set to "**ON**", this parameter displays. Key of the IMSI.
opc	When "**softUsim**" is set to "**ON**", this parameter displays. The operator's code.
MTU	Maximum transmission unit, refers to the maximum size of the data portion that a data link layer frame can carry. Range: 0 -5000.
MSS	TCP maximum segment size, refers to the maximum length of the data portion in a TCP segment. Range: 0 -5000.

3. In "**IPsec Tunnel List**" area, click to display the IPsec tunnel configuration page. First, configure the basic parameters of IPsec tunnel mode, as shown in Figure 6-6.

Figure 6-6 Basic Setting of IPsec Tunnel Mode



NOTE: Configuration parameters are different according to the value of "LeftAuth".

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

Table 6-5 IPsec Tunnel Basic Parameter Description

Parameter	Description
LeftAuth	**ATTENTION**: DO NOT recommend changing the value! Local authentication type of the IPsec. Must be consistent with the security gateway side. • PSK • PUBKEY • eap-aka
RightAuth	**ATTENTION**: DO NOT recommend changing the value! Local authentication type of the IPsec. Must be consistent with the security gateway side. • PSK • PUBKEY • eap-aka
Gateway	The security gateway (IPsec server) IP address. Make sure

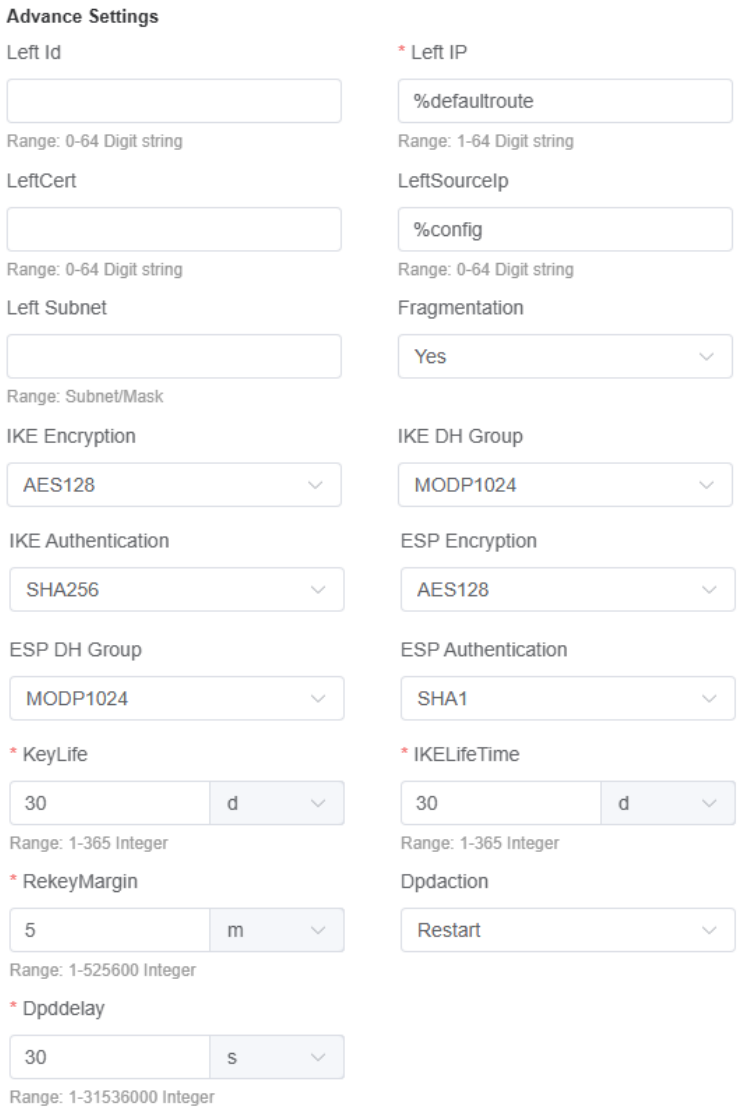
Parameter	Description
	the IP address entered here matches the actual IP address on the security gateway side.
Right Subnet	IP address of the remote subnet, which must be consistent with the security gateway side. Message within this address range will be packed as a tunnel.
Right Id	Identification of 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.
SecretKey	File name of private key, by default is clientKey.der. When the authentication is set to *psk*, the value is the password of authentication.

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.

4. Click the > in the advanced area to display the advanced setting page, as shown in Figure 6-7.

Figure 6-7 Advanced Setting of IPsec Tunnel Mode



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

Table 6-6 Advanced Parameter Description of IPsec Tunnel Mode

Parameter	Description
Left Id	Identification of the client end (0-64 digits string). It must be consistent with the security gateway side. If there is no security gateway left identifier, leave this field empty.
Left IP	IP address of the client end.

Parameter	Description
LeftCert	If set “**left Auth**” to “**pubkey**”, the parameter needs to be set. Certificate name. On this version is *clientCert.derpsk.*
LeftSourceIp	Virtual address allocation assigned by the system. If absent, use the local IP address
Left Subnet	IP address of the local subnet.
Fragmentation	The type of fragmentation. • YES • ACCEPT • FORCE • NO
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 • DES
IKE DH Group	IKE Diffie-Hellman (DF) key computation, or exponential key agreement, to be used between two entities. • MODP768 • MODP1024 • MODP1536 • MODP2048 • MODP4096 • none

Parameter	Description
IKE Authentication	Authentication algorithm • SHA1 • SHA1_160 • SHA256_96 • SHA256
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 • DES
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 • SHA1_160 • SHA256_96 • SHA256
KeyLife	IPsec security association (SA) renegotiation time. Format: Seconds, Minutes, Hours or Days.

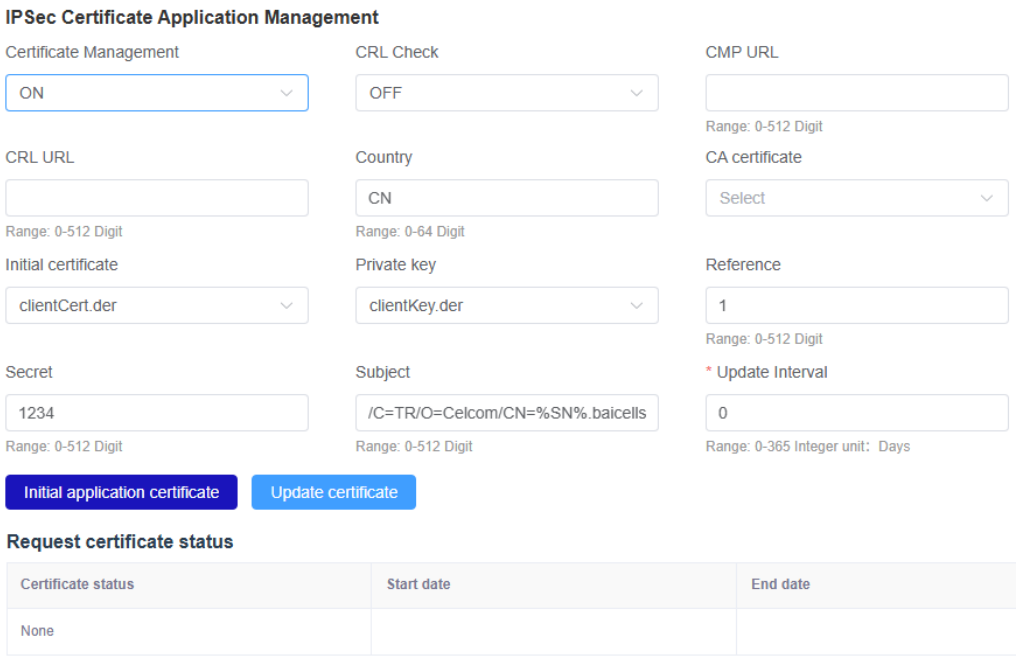
Parameter	Description
IKELifetime	IKE security association renegotiation time. Format: Seconds, Minutes, Hours or Days.
RekeyMargin	Renegotiation time before the expiry of IKE life time (negotiate the IKE security association time before the expiry of IKE life time). Format: Seconds, Minutes, Hours or Days.
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: Seconds, Minutes, Hours or Days.
Left Interface	The interface on the eNB side.

5. Click “**Save**” to complete the IPsec configuration.

- IPSec certificate application management

1. If you need to enable IPsec certificate application management, configure the parameters as shown in Figure 3-1

Figure 6-8 IPSec Certificate Application Management



The parameter description is shown in Table 6-7.

Table 6-7 IPsec Certificate Application Management Parameter Description

Parameter	Description
CRL Check	Enable or disable certificate revocation list (CRL) check.
CMP URL	The address of the Certificate Management Protocol (CMP) server. The CMP server is used to perform certificate management operations such as certificate application, update, and revocation.
CRL URL	The network address of the server that stores and provides certificate revocation list data to the outside.
Country	The country where the certificate subject belongs, usually represented by an ISO 3166 two-letter code.
CA Certificate	Select the certificate authority (CA) from the drop-down list.
Initial Certificate	The certificate obtained by the device during initial

Parameter	Description
	operation or first automatic application.
Private Key	Encrypted data generated in pairs with a public key. In IPsec, the private key is used to sign data and decrypt information encrypted with the corresponding public key, and it is a key element for realizing identity authentication and data confidentiality.
Reference	Reference number.
Secret	Confidential information, used to encrypt communication content or verify device identity.
Subject	Certificate subject.
Update Interval	The cycle for automatic certificate update.

2. Select “Initial application certificate” or “Update certificate”.

- IPSec certificate application management

1. Select the type of IPsec certificate, including three types:
   - IPsec CA Certs: ROOT certificate
   - IPsec Equipment Certs: Certificate of server and client
   - IPsec Private Certs: Private key of server and client
2. Click “Select File” to upload corresponding IPsec certificate file.

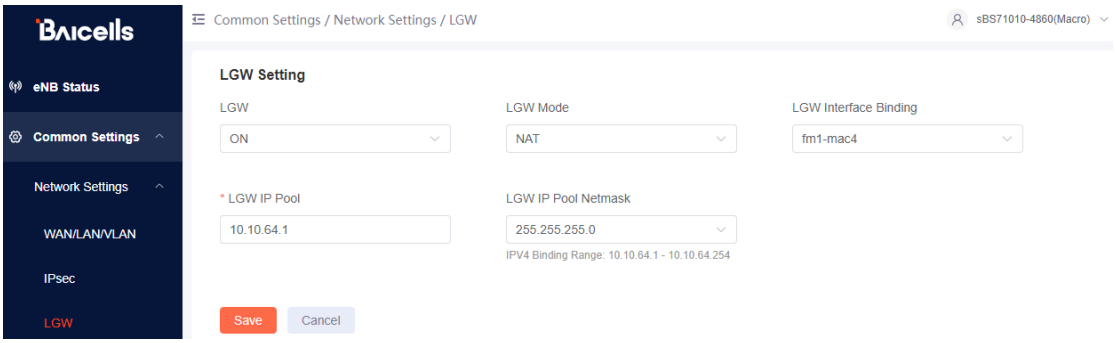
6.1.3 Configure LGW

The eNB must be rebooted after the LGW configuration is 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 “**Common Settings > Network Settings > LGW**” to enter the LGW configuration page, as shown in Figure 6-9.

Figure 6-9 Configure LGW



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

Table 6-8 LGW Parameter Description

Parameter	Descriptions
LGW	LGW function switch. Choose to enable or disable the LGW function. After the LGW is set to ON, the LGW configuration parameters are displayed.
Get UE IMSI	When the "**LGW**" is set to "**OFF**", the parameter displays. Select whether to obtain the UE IMSI number. After obtaining the UE IMSI, the UE IMSI is displayed in the UE information list on the home 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. The interface has already been configured in the "6.1.1 Configure WAN/VLAN". Default is WAN interface, the VLAN

Parameter	Descriptions
	interface can also be used to separate different links.
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 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 254 IP addresses. **NOTE**: 0 and 255 is not available.
Static Address	When "**LGW Mode**" is "**Router**", this parameter displays. Whether use the static IP address.
First Address	When "**Static Address**" is "**ON**", the parameter displays. The first IP address of the static IP address range.
Last Address	When "**Static Address**" is "**ON**", the parameter displays. The last IP address of the static IP address range.
IPV6	Enable or disable IPV6.
LGW IPV6 Pool	When "**LGW Mode**" is set to "**Router**" and "**IPV6**" is set to "**ON**", the parameter displays. The IPV6 address pool.
LGW IPV6 Prefix	When "**LGW Mode**" is set to "**Router**" and "**IPV6**" is set to "**ON**", the parameter displays. The IPV6 prefix.
IPV6 Static Address Switch	When "**LGW Mode**" is set to "**Router**" and "**IPV6**" is set to "**ON**", the parameter displays. Enable or disable the IPV6 static IP address.
IPV6 First Address	When "**LGW Mode**" is set to "**Router**", "**IPV6**" and "**IPV6 Static Address Switch**" is set to "**ON**", the parameter displays.

Parameter	Descriptions
	The first IP address of the IPV6 static IP address range.
IPV6 Last Address	When “**LGW Mode**” is set to “**Router**”, “**IPV6**” and “**IPV6 Static Address Switch**” is set to “**ON**”, the parameter displays. The last IP address of the IPV6 static IP address range.

3. (Optional) If “**LGW Mode**” is set to “**Router**” and “**Static Address**” is set to “**ON**”, the parameters of IMSI to IP binding displays, as shown in Figure 6-10.

Figure 6-10 IMSI to IP Binding

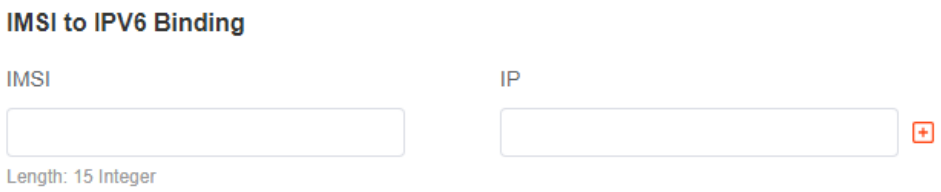
Input the IMSI to IP binding configuration parameters, as shown in Table 6-9.

Table 6-9 IMSI to IP Binding Parameter Description

Parameter	Descriptions
IMSI	IMSI binding with the IP address
IP	IP address binding with the IMSI After an IMSI and IP address is typed in, click **+** to add the IP address.

4. (Optional) If “**LGW Mode**” is set to “**Router**”, “**IPV6**” is set to “**ON**”, and “**IPV6 Static Address Switch**” is set to “**ON**”, the parameters of IMSI to IPv6 binding displays, as shown in Figure 6-11.

Figure 6-11 IMSI to IPV6 Binding



Description of IMSI to IPv6 binding configuration parameters refers to Table 6-9.

5. Click “**Save**” to complete the LGW setting.

6.1.4 Configure Core Network

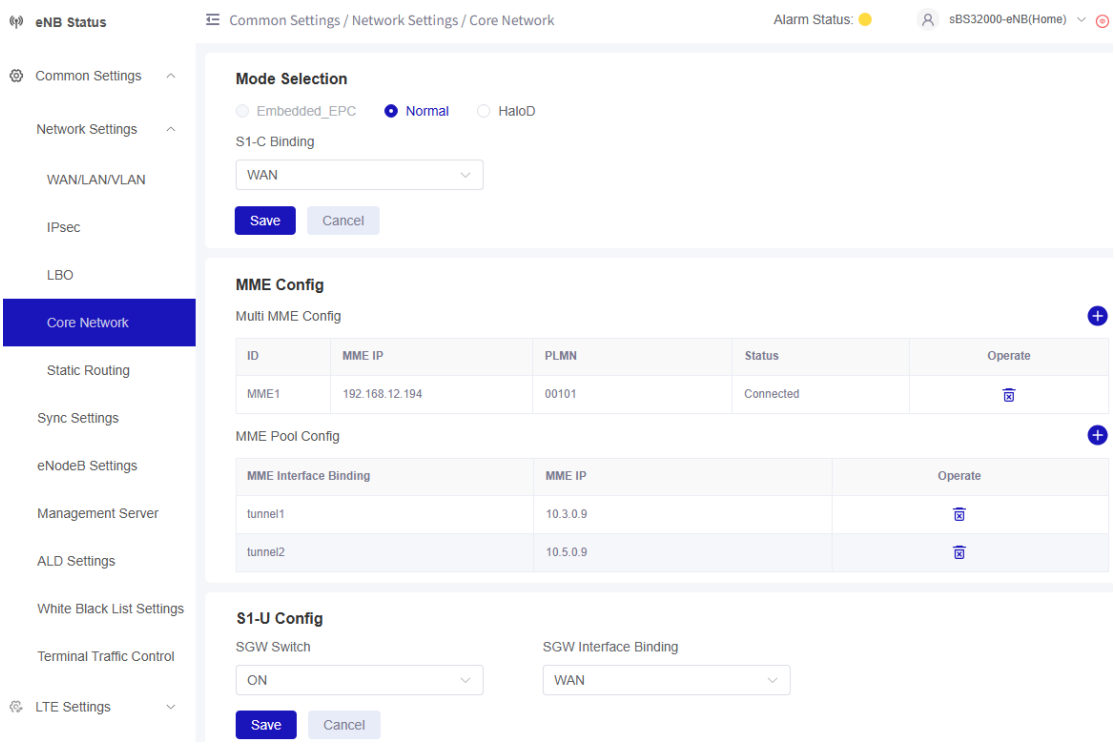
In Core Network menu, you can set the eNB operates in Normal mode and HaloD mode.

6.1.4.1 Normal Mode

In the left navigation column, select “**Common Settings > Network Settings > Core Network**” to enter the core network parameter configuration page, as shown in Figure 6-12.

NOTE: The default page of Core Network menu is Normal mode.

Figure 6-12 Core Network Setting – Normal Mode



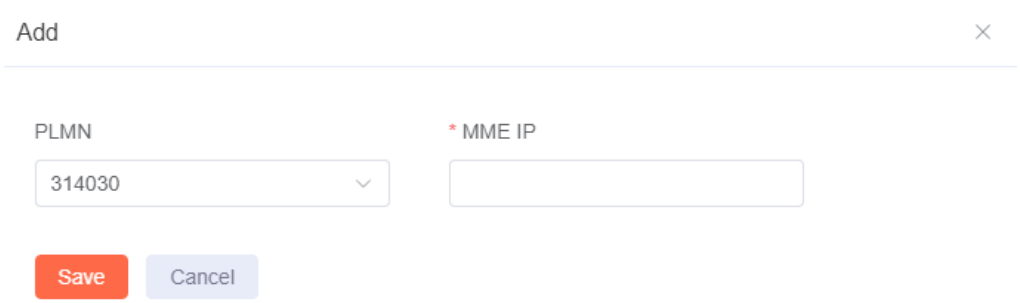
Core network configuration includes S1-C control plane and S1-U user plane configuration.

- S1-C binding

  a) Select the interface binding with S1-C plane, which has been configured in "6.1.1 Configure WAN/VLAN".

  b) In Multi MME Config list, click ⊕ to pop up multi-MME configuration window, as shown in Figure 6-13.

  Figure 6-13 Multi MME Configuration



NOTE: PLMN has been configured in chapter "5 Basic Setting".

c) Select PLMN from the drop-down list.

d) Input corresponding MME IP address.

e) In MME pool Config list, click , to pop up MME interface binding window, as shown in Figure 6-14.

Figure 6-14 MME Interface Binding

f) Select MME IP address for two IPsec tunnels separately.

If the MME IP address needs to be modified, delete the binding and add it again.

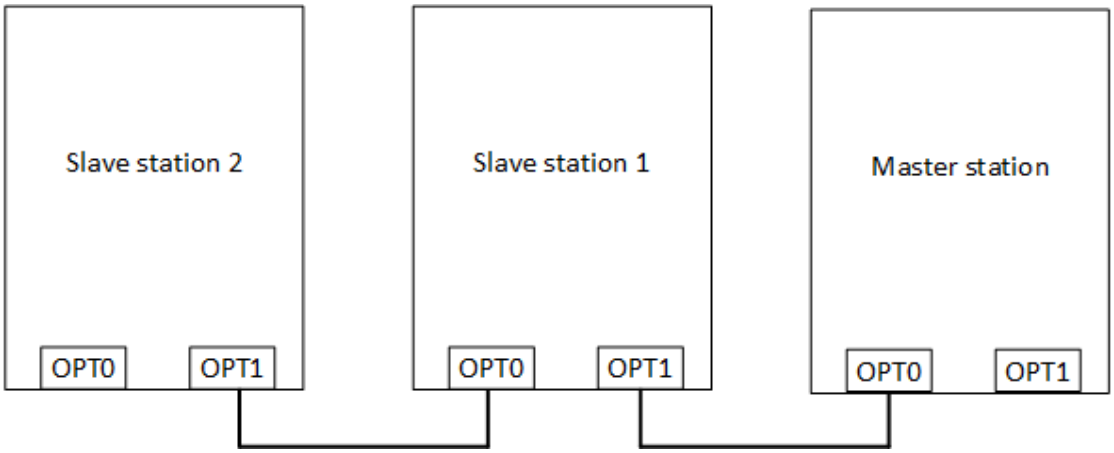
- S1-U (SGW) setting

If the SGW Switch is set to "**ON**", select the SGW binding interface from the drop-down list, which has been configured in "6.1.1 Configure WAN/VLAN".

6.1.4.2 HaloD Mode

HaloD function is developed by Baicells that sinks the gateway (WCG) function to the eNB. By using this function, the complexity of network connection is reduced and the backhaul resources are shared. One eNB is configured as the master station, and up to two level slave eNBs are supported to share backhaul resources.The connection of HaloD eNB is shown in Figure 6-15.

Figure 6-15 HaloD Connection

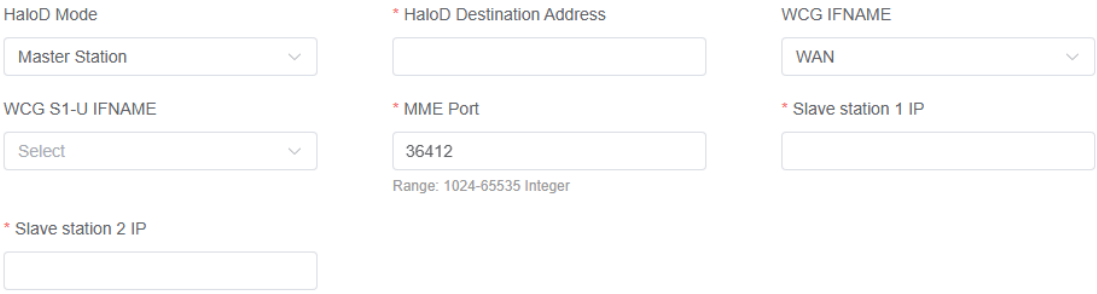


Configuring HaloD scenarios should pay attention to following configuration rules.

- Only the master eNB needs to configure the external connected parameters, not the slave eNB.
- The eNB ID, PLMN and TAC of master and slave eNBs must be the same, and the eNB type is Home.
- The MME IP of slave eNBs is the HaloD IP of the master eNB.

1. In Mode selection list, select **HaloD** to enter the HaloD configuration page.
   - If the eNB is the “Master Station”, the parameters are shown in Figure 6-16.

     Figure 6-16 Core Network Setting – HaloD Mode (Master Station)



   - If the eNB is a “Slave Station”, the parameters are shown in Figure 6-17.

Figure 6-17 Core Network Setting – HaloD Mode (Slave Station)

NOTE: When the base station is configured as a slave station, the base station's network port automatically operates in bridge mode.

2. Type in parameter values, the parameter description is shown in Table 6-10.

Table 6-10 HaloD Parameter Description

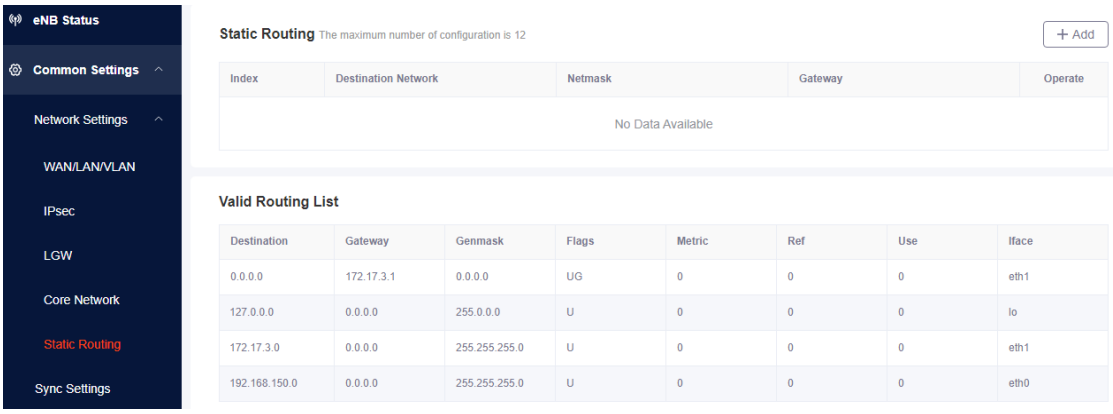
Parameter	Description
HaloD Mode	The operating mode of the eNB. • **Master Station**: The eNB is the master eNB in HaloD mode, and following parameters should be set. • **Slave Station 1**: The eNB is the first cascading eNB in HaloD mode. • **Slave Station 2**: The eNB is the second cascading eNB in HaloD mode.
HaloD Destination Address	If "**HaloD Mode**" is set to **Master Station**, this parameter displays. The IP address is used to connect to the slave eNB.
WCG IFNAME	If "**HaloD Mode**" is set to **Master Station**, this parameter displays. The interface bound with the control plane for HaloD.
WCG SI-U IFNAME	If "**HaloD Mode**" is set to **Master Station**, this parameter displays. The interface bound with the user plane for HaloD.
MME Port	The port number is used by HaloD.
Slave station 1 IP	If "**HaloD Mode**" is set to **Master Station**, this parameter

Parameter	Description
	displays. IP address of slave station 1.
Slave station 2 IP	If “**HaloD Mode**” is set to **Master Station**, this parameter displays. IP address of slave station 2.
HaloD Source Address	If “**HaloD Mode**” is set to **Slave Station**, this parameter displays. The IP address is used to communicate with the master station.

6.1.5 Configure Static Routing

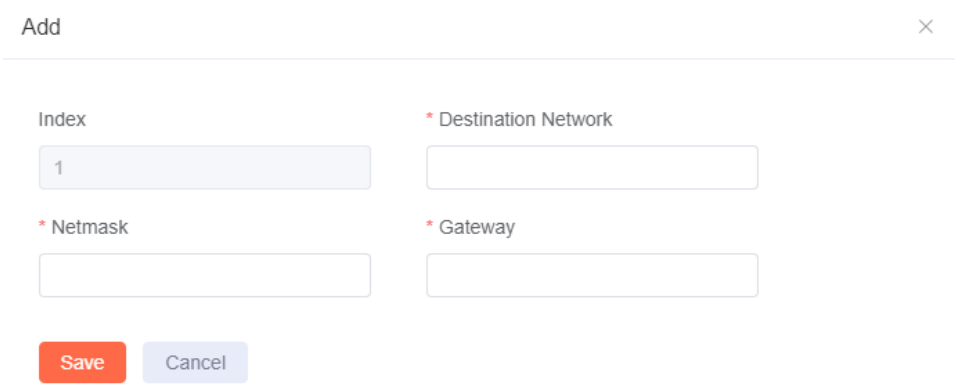
1. Select “**Common Settings > Network Settings > Static Routing**” to enter the static route configuration page, as shown in Figure 6-18.

Figure 6-18 Configure Static Routing



2. Click **+ Add** to display static configuration parameters, as shown in Figure 6-19.

Figure 6-19 Add a Static Route



3. Input the configuration parameters of static route, which are given in Table 6-11.

Table 6-11 Static Route Parameter Description

Parameter	Description
Index	The index of the static route. Assigned automatically.
Destination Network	The destination IP address. **NOTE**: The destination IP address must be reachable from the original IP address of WAN interface or VLAN source port.
Netmask	The subnet mask of destination IP address.
Gateway	The gateway IP address of target IP address.

4. Click “Save” to complete the static route configuration.

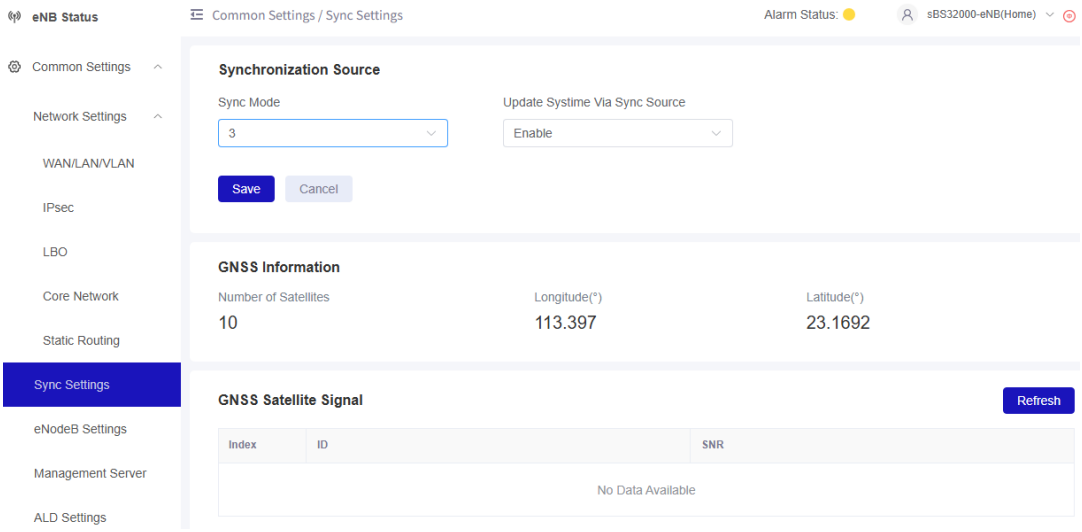
   The system supports configuring up to 12 static routes. The routing table displays at the bottom of the page.

6.2 Synchronization Setting

The LTE technology standards specify timing and synchronization requirements between adjacent eNBs. Synchronized transmissions help avoid eNBs interfering with one another, optimize bandwidth usage, and enhance network capacity. The GNSS and PTP synchronization mode are supported.

In the left navigation column, select "**Common Settings > Sync Settings**" to enter the synchronization configuration page, as shown in Figure 6-20.

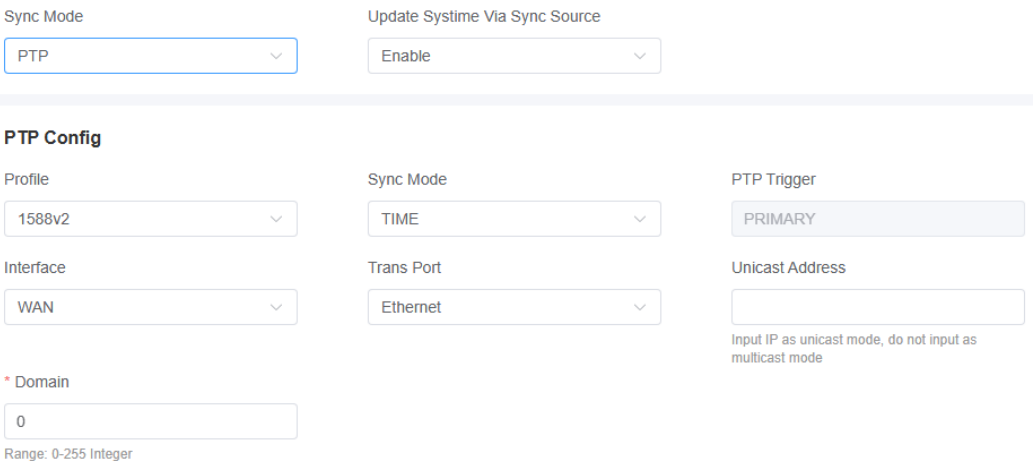
Figure 6-20 Synchronization Setting



- PTP: Precision timing protocol

  When "**Sync Mode**" is set to "PTP", set whether update system time via sync source first, the page is shown in Figure 6-21.

  Figure 6-21 Synchronization Setting- PTP



  The PTP parameters should be configured, as shown in Table 6-12.

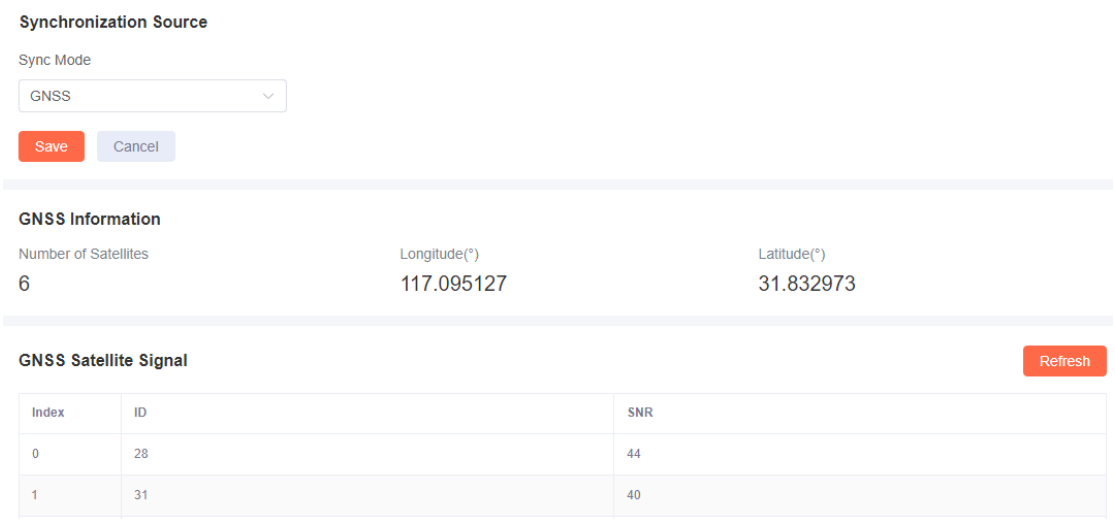
Table 6-12 PTP (1588v2) Parameter Description

Parameter	Description
Profile	Select the synchronization protocol. • 1588V2 • G8265.1
Sync Mode	Synchronization mode, TIME or FREQ.
PTP Trigger	This parameter is fixed to primary, which is set by the system.
Interface	Select the interface used by the PTP synchronization signal from the drop-down list.
Transport	Transport protocol. • Ethernet • UDP When the adopted configuration file is G8265.1, only UDP is supported.
Unicast Address	The address for unicast.
Domain	Domain ID.

- GNSS: GPS and GLONASS synchronization signal is supported.

  When "**Sync Mode**" is set to "GPS" or "GLONASS", the page displays the number of satellites, longitude, latitude and the satellite signal level. Take GNSS as an example, the page is shown in Figure 6-22.

Figure 6-22 Synchronization Setting- GNSS

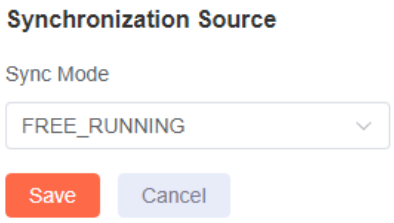


NOTE: Click "Refresh" to refresh the current status of satellite signal.

- FREE_RUNNING: If there is no synchronization resource, select free running mode.

When "**Sync Mode**" is set to "FREE_RUNNING", no other parameters are configured, the page is shown in Figure 6-23.

Figure 6-23 Synchronization Setting –FREE_RUNNING

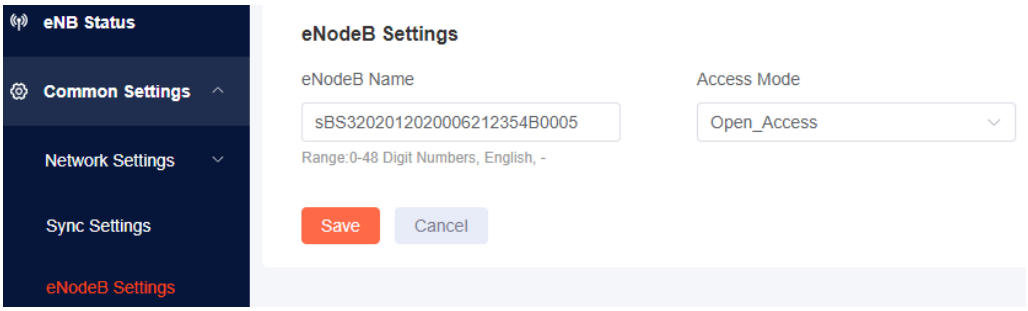


Select FREE_RUNNING, there is no need to connect any clock source, relying on its own crystal oscillator to provide synchronous clock.

6.3 eNodeB Setting

1. In the left navigation column, select "**Common Settings > eNodeB Setting**" to enter the eNodeB configuration page, as shown in Figure 6-24.

Figure 6-24 eNodeB Setting



2. Input the eNodeB setting parameters, which descriptions are given in Table 6-13.

Table 6-13 eNB Setting Parameter Description

Parameter	Description
eNodeB Name	The eNodeB's name.
Access Mode	Select the access mode. • Open_Access • Closed_Access • Hybrid_Access
CSG ID	When "Access Mode" is set to "Closed_Access" or "Hybrid_Access", this parameter displays. Closed Subscriber Group (CSG) ID.
CSG Start PCI	When "Access Mode" is set to "Closed_Access", this parameter displays. The start PCI of the CSG.
CSG PCI Range	When "Access Mode" is set to "Closed_Access", this parameter displays. The range of the PCI.

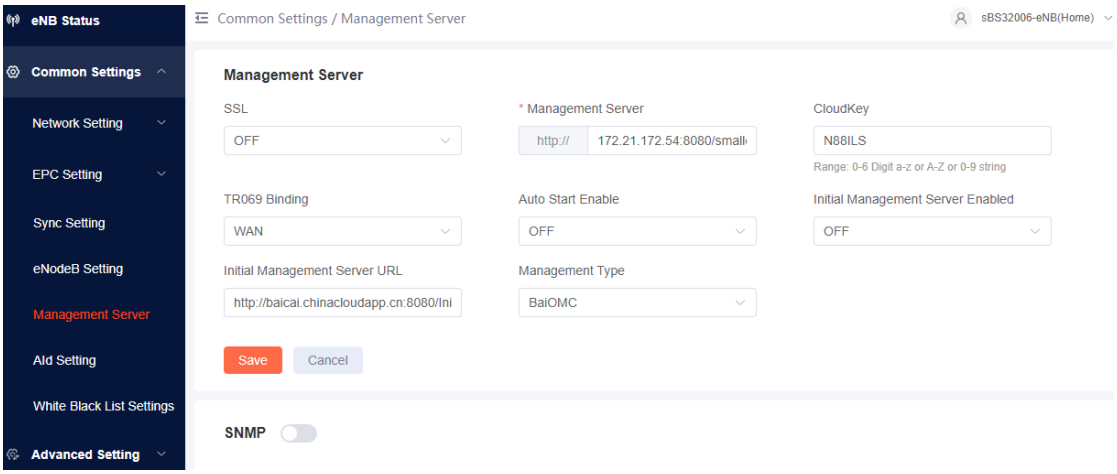
6.4 Management Server

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 "**Common Settings > Management Server**" as shown in Figure 6-25.

Figure 6-25 Configure Management Server



2. Input the network management parameters, which descriptions are given in Table 6-14.

Table 6-14 Network Management Server Parameter Description

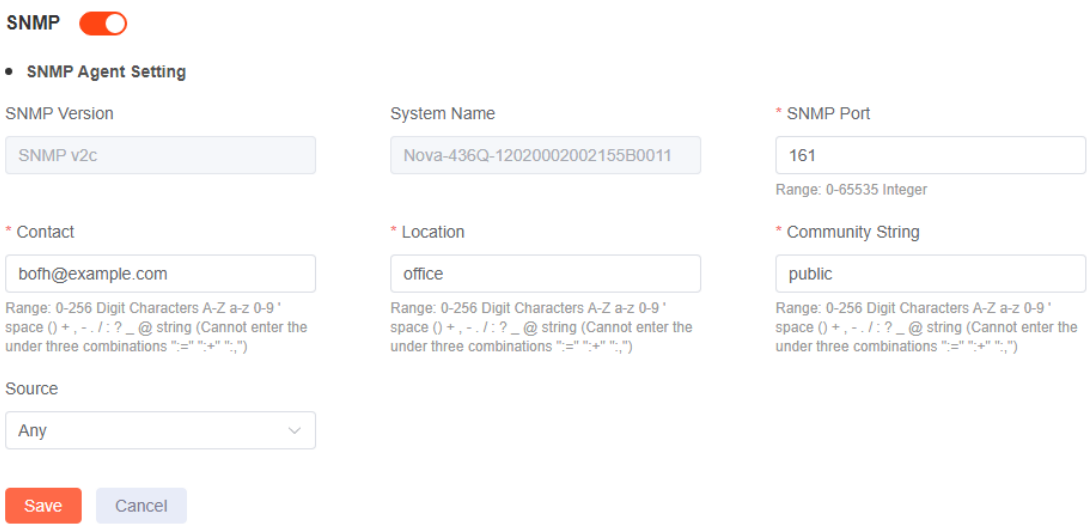
Parameter	Description
SSL	Enable or disable SSL. If the SSL is enabled, the eNB connects to the OMC through HTTPS protocol, the management server address is started with *HTTPS*.
Management Server	IP address and port number of the NMS. When the NMS is cloud NMS, the domain name is also supported.

Parameter	Description
CloudKey	The NMS assigns a unique cloud key for each operator. When eNB registered with the NMS, the eNB can be identified by NMS. The default factory setting of Cloud Key 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 Cloud Key is set to an invalid value, the NMS will deny the access of the eNB.
TR069 Binding	The interface binding with TR069 protocol.
Auto Start Enable	Enable or disable auto start function.
Initial Management Server Enabled	Enable or disable initial management server.
Initial Management Server URL	The URL of the initial management server. The address is pre-configured, if this function is enabled, the eNB will connect to the initial server automatically after powered on, the server will issue OMC address to the eNB.
DataModelType	Select data model type. • Standard • ChinaMobile • JingXin • OMC

3. If the base station will report KPI information to the third-party NMS, enable the SNMP function, as shown in Figure 6-26.

NOTE: If the SNMP function is enabled, the KPIs will not be reported to the BaiOMC.

Figure 6-26 SNMP Agent Setting



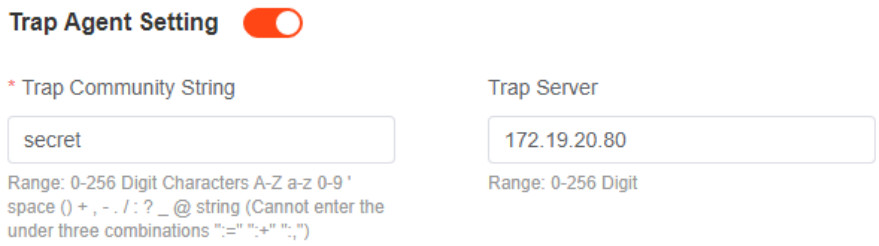
4. Input SNMP configuration parameters, which descriptions are given in Table 6-15.

Table 6-15 SNMP Configuration Parameter Description

Parameter Name	Description
SNMP Version	The current supported SNMP version is SNMPv2c.
System Name	The name of the community.
SNMP Port	The port of SNMP protocol used.
Contact	Contact method, general is an XCe-mail.
Location	The location of the system.
Community String	Community string. Default is public.
Source	The source address of acquiring information. • Any • Specific Network
Source Network	If “Source” is set to “Specific Network”, the parameter displays. The IP address of the source network.

5. If trap agent function is enabled, which is shown in Figure 6-27.

Figure 6-27 Trap Agent Setting



6. Input trap configuration parameters, which descriptions are given in Table 6-16.

Table 6-16 Trap Configuration Parameter Description

Parameter Name	Description
Trap Community String	Trap community string
Trap Server	The IP address of the trap server.

7. Click "**Save**" to complete the management server configuration.

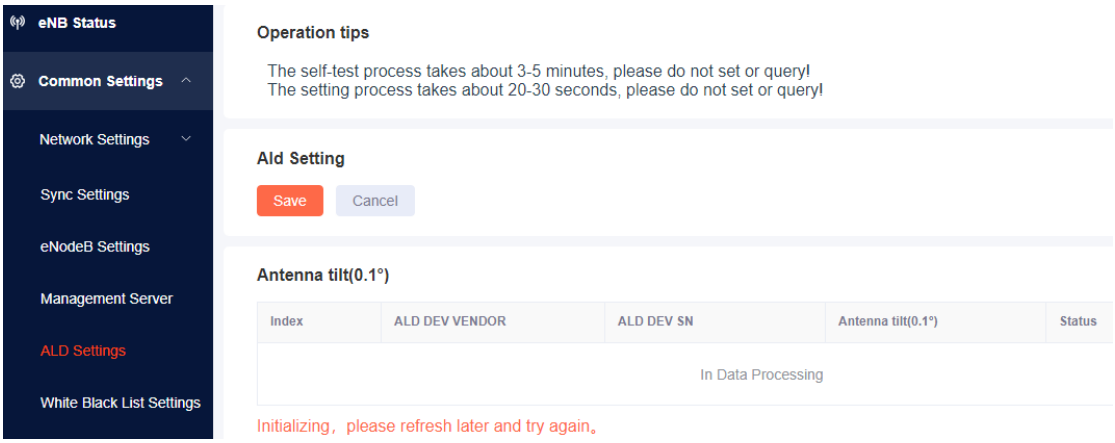
6.5 ALD Setting

The *Ald setting* menu is used to configure the smart antenna on LMT, which adjusts the downtilt of antennas. The eNB supports RS485 communication method between the eNB and the antenna. 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 are as follows.

In the left navigation column, select "**Common Settings > ALD Settings**" to enter the RET setting page, as shown in Figure 6-28.

Figure 6-28 ALD Setting



After the antenna is connected to the eNB, the configuration parameters display. If the eNB is in cascading working mode, there are up to three antennas should be set the RET.

Type in the downtilt of the antenna. The value range is dynamically adjusted based on the electrical tilt antenna. The unit is 0.1°.

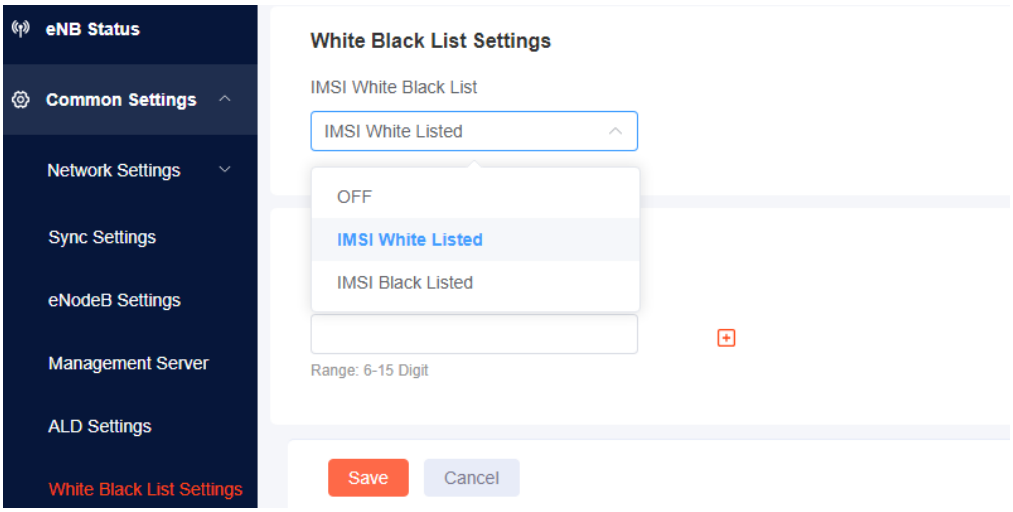
The result will be shown in the Antenna tilt table.

6.6 Whitelist/Blacklist Settings

The eNB supports whitelist and blacklist. After whitelist is set, only terminals in the whitelist can access the eNB. After blacklist is set, terminals in the blacklist cannot access the eNB.

1. In the left navigation column, select "**Common Settings > White Black List Settings**" to enter the whitelist and blacklist configuration page, as shown in Figure 6-29.

Figure 6-29 Whitelist/Blacklist Settings

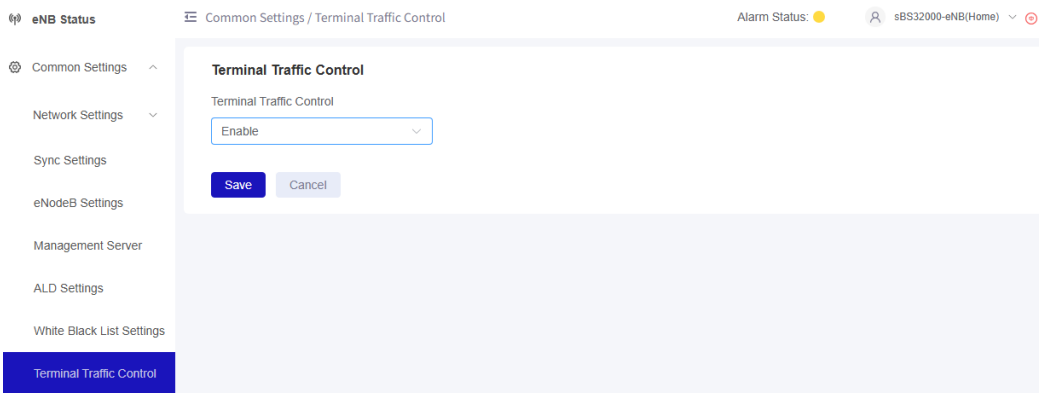


2. If “IMSI White Listed” or “IMSI Black Listed” is selected, following shows a text box, type in IMSIs.
3. Click **+** to add IMSIs to whitelist or blacklist.
4. (optional) If whitelist is selected, you can batch import of IMSIs.
5. Click “**Save**” to complete the whitelist and blacklist setting.

6.7 Terminal Traffic Control

In the left navigation column, select “**Common Settings > Terminal Traffic Control**” to enter the whitelist and blacklist configuration page, as shown in Figure 6-30.

Figure 6-30 Terminal Traffic Control



Select whether to turn on terminal flow control.

7. LTE Settings

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.

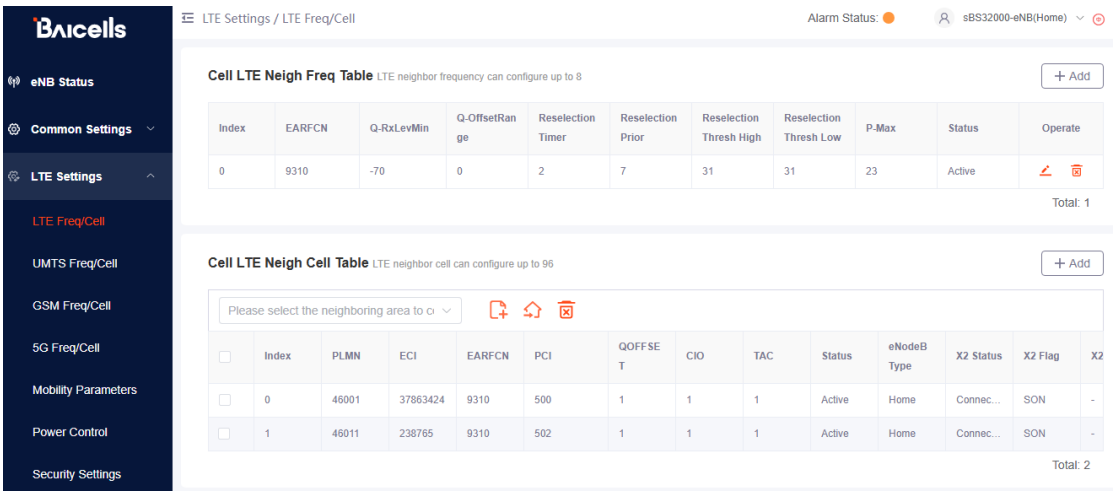
The LTE menu contains several sub-menus related to mobility as well as other radio-related settings. Many LTE parameters are important for efficient wireless network operations.

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.

7.1 Configure LTE Neighbor Frequency and Cell

1. Select "**LTE Settings > LTE Freq/Cell**" to enter the LTE neighbor frequency and cell configuration page, as shown in Figure 7-1.

Figure 7-1 LTE Neighbor Frequency/Cell Settings



Users can add, modify, and delete the LTE neighbor frequency and cell. Up to eight LTE neighbor frequencies and 160 LTE neighbor cells can be set.

LTE Neighbor Frequency

2. In the neighbor frequency list, click **+Add** to enter the page for adding an LTE neighbor frequency. The parameter descriptions are given in Table 7-1.

Table 7-1 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 65535.
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 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.
Reselection Timer	Timer of the cell reselection to cells at this frequency. Range is 0 to 7 (integer).
Reselection Prior	Priority of the cell reselection to cells at this frequency. Range is 0 to 7 (integer). A typical value is 4.
Reselection 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.
Reselection Thresh Low	The cell reselection threshold for lower priority inter-band frequency.

Parameter	Description
	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 -50 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 **+Add** to enter the page for adding a LTE neighbor cell, the parameter descriptions are given in Table 7-2.

Table 7-2 LTE Neighbor Cell Parameter Description

Parameter	Description
PLMN	The 5-6 digit PLMN that the neighbor cell belongs to.
Cell ID	Unique identification number for the Cell.
EARFCN	Frequency point of the neighbor cell.
PCI	Physical Code Identity. Range is from 0 to 503.
QOFFSET	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 -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.

Parameter	Description
	Range is +24 to -24. A typical value is 0dB.
TAC	Tracing Area Code (TAC) of this neighbor cell.
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.
X2 Flag	X2 flag. Options are SON (auto) and Manual.

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

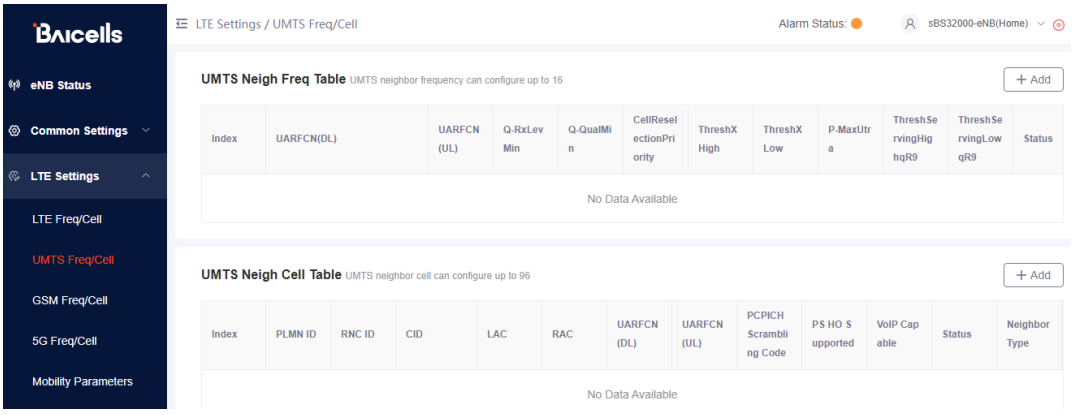
7.2 Configure UMTS Neighbor Frequency and Cell

Parameters in this menu is related to how adjacent base stations operating with UMTS technology work with the Baicells LTE eNB that you are configuring.

You will define for the Baicells eNB how to deal with any neighboring UMTS base stations.

1. Select "**LTE Settings > UMTS Freq/Cell**" to enter the UMTS neighbor frequency and cell configuration page, as shown in Figure 7-2.

Figure 7-2 UMTS Neighbor Frequency/Cell Settings



Users can add, modify, and delete the UMTS neighbor frequency and cell. Up to 16 UMTS neighbor frequencies and 96 UMTS neighbor cells can be set.

UMTS Neighbor Frequency

2. On the right of the neighbor frequency list, click **+Add** to enter the page for adding a UMTS neighbor frequency. The parameter descriptions are given in Table 7-3.

Table 7-3 UMTS Neighbor Frequency Parameter Description

Parameter	Description
UARFCN(DL)	Downlink frequency point of the neighboring base station's frequency.
UARFCN(UL)	Uplink frequency point of the neighboring base station's frequency.
Q-RxLevMin	The minimum received signal level at which a UE will detect a neighboring base station'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.
Q-QualMin	The threshold for lowest access. Range: -24 to 0.
CellReselection Priority	Priority of cell reselection to cells at this frequency.
ThreshXHigh	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.
ThreshXLow	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

Parameter	Description
	absolute priority than the serving cell). Range is 0 to 31dB.
P-MaxUtra	The maximum transmit power a UE allowed to use in the uplink, for limiting the transmit power of the UE within this cell
ThreshServingHighqR9	Inter-frequency High Priority Reselection Threshold: This parameter refers to the access level threshold for the UE (User Equipment) to reselect from the serving cell to a cell under the target frequency when the cell reselection priority of the target frequency is higher than that of the serving cell. Range is 0 to 31dB.
ThreshServingLowqR9	Inter-frequency Low Priority Reselection Threshold: This parameter refers to the access level threshold for the UE (User Equipment) to reselect from the serving cell to a cell under the target frequency when the absolute priority of the target frequency is lower than that of the serving cell. Range is 0 to 31dB.

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

UMTS Neighbor Cell

4. On the right of the neighbor cell list, click **+Add** to enter the page for adding an UMTS neighbor cell. The parameter descriptions shown are given in Table 7-4.

Table 7-4 UMTS Neighbor Cell Parameter Description

Parameter	Description
PLMN Id	The PLMN that the neighbor cell belongs to
RNC Id	The neighbor cell’s Radio Network Controller (RNC).
CID	Identity of the neighbor cell. ECI=Cell ID
LAC	Location Area Code (LAC) of the neighbor cell

Parameter	Description
RAC	Radio Admission Control.
UARFCN(DL)	UARFAN for download.
UARFCN(UL)	UARFAN for upload.
PCPICH Scrambling Code	Scrambling code for main CPICH.
psHoSupported	This neighbor whether support PS domain switchover.
VoIP Capable	Whether enable VoIP function.

5. Click “**Save**” to complete the UMTS neighbor cells setting.

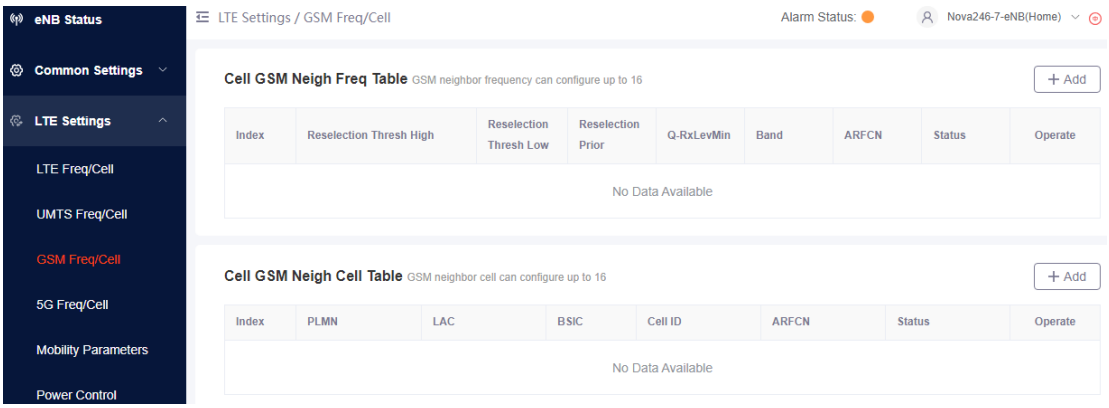
7.3 Configure GSM Neighbor Frequency and Cell

Parameters in this menu is related to how adjacent base stations 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 base stations.

1. Select “**LTE Settings > GSM Freq/Cell**” to enter the GSM neighbor frequency and cell configuration page, as shown in Figure 7-3.

Figure 7-3 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 **+Add** to enter the page for adding a GSM neighbor frequency. The parameter descriptions are given in Table 7-5.

Table 7-5 GSM Neighbor Frequency Parameter Description

Parameter	Description
Band	Channels in which the GSM neighbor operates: • GSM850 • GSM900 • DCS1800 • PSC1900
ARFCN	ARFCN for GSM neighbor frequency.
Reselection 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.
Reselection 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.
Reselection Priority	Priority of the 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 GSM neighbor frequency setting.

GSM Neighbor Cell

4. In the neighbor cell list, click **+Add** to enter the page for adding a GSM neighbor frequency. The parameter description is given in Table 7-6.

Table 7-6 GSM Neighbor Cell Parameter Description

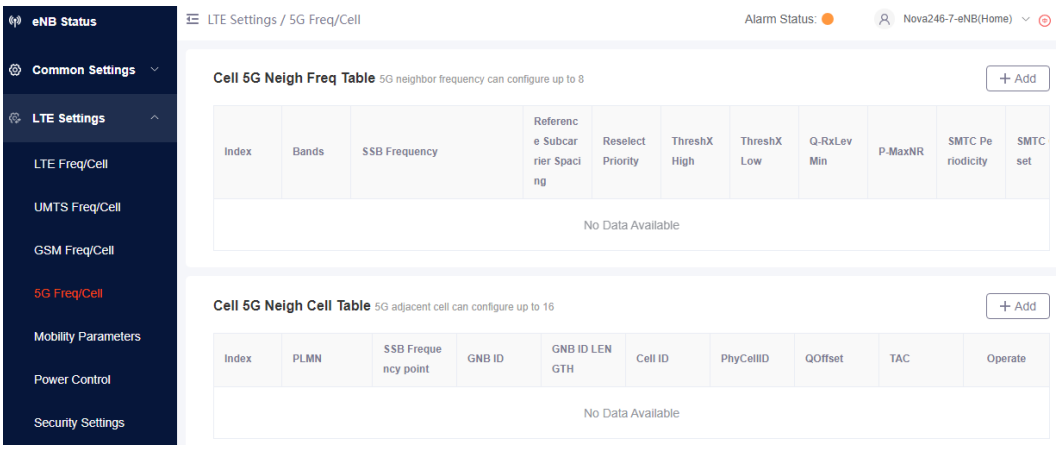
Parameter	Description
ARFCN	ARFCN of the neighbor cell
PLMN	The PLMN that the neighbor cell belongs to.
LAC	Location Area Code (LAC) of the neighbor cell.
BSIC	The base station identification code of the neighbor cell
Cell ID	Identity of the neighbor cell. ECI=Cell ID

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

7.4 Configure 5G Neighbor Frequency and Cell

1. Select "**LTE Settings > 5G Freq/Cell**" to enter the 5G neighbor frequency and cell configuration page, as shown in Figure 7-4.

Figure 7-4 5G Neighbor Frequency Setting



Users can add, modify, and delete the 5G neighbor frequency and cell. Up to 8 5G neighbor frequencies and 16 5G neighbor cells can be set.

5G Neighbor Frequency

2. In the neighbor frequency list, click **+Add** to enter the page for adding a 5G neighbor frequency. The parameter descriptions are given in Table 7-7.

Table 7-7 5G Neighbor Frequency Parameter Description

Parameter	Description
Bands	Bands in which the 5G neighbor gNB operates
SSB Frequency	Absolute Radio Frequency Channel Number (ARFCN) of the NR neighbor cell.
Reference Subcarrier Spacing	Select the sub carrier spacing. Range is 0 to 4 (integer).
ReselectPriority	Priority of the cell reselection to cells at this frequency. Range is 0 to 7 (integer). A typical value is 4.
ThreshX 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.
ThreshX 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.
Q-RxLevMin	Minimum access level. When the receive signal power of UE is larger than this threshold, the UE can resident on the cell.

Parameter	Description
P-MaxNr	The maximum transmit power that UEs in this cell are allowed to use in the uplink. Range is -33 to 33 dBm. A typical value is 23 dBm.
SMTC Periodicity	The period of (SSB-based RRM Measurement Timing Configuration) SMTC. • 0: sf5 • 1: sf10 • 2: sf20 • 3: sf40 • 4: sf80 • 5: sf160
SMTC Offset	The offset of SMTC. Range is from 0 to 159.
SMTC Duration	The duration time of SMTC. Range is from 0 to 4 (integer).

3. Click "**Save**" to complete the 5G neighbor frequency setting.

5G Neighbor Cell

4. In the neighbor cell list, click **+Add** to enter the page for adding a 5G neighbor frequency. The parameter descriptions as given in Table 7-8.

Table 7-8 5G Neighbor Cell Parameter Description

Parameter	Description
PLMN	The PLMN that the neighbor cell belongs to.
SSB Frequency Point	Absolute Radio Frequency Channel Number (ARFCN) of the SSB neighbor cell.
GNB ID	Identify of the gNB neighbor cell.
GNB ID LENGTH	The length of the GNB ID. Grange is from 22-32 digit alphabet.

Parameter	Description
Cell ID	Identity of the neighbor cell. ECI=Cell ID
PhyCellID	Physical cell ID.
QOffset	Indicates the difference in signal level between the serving and neighboring gNBs, as determined by the received signal level at the UE. If the received signal level is better from a neighboring gNB 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.
TAC	TAC of the neighbor cell.

5. Click "**Save**" to complete the setting of the 5G neighbor cell.

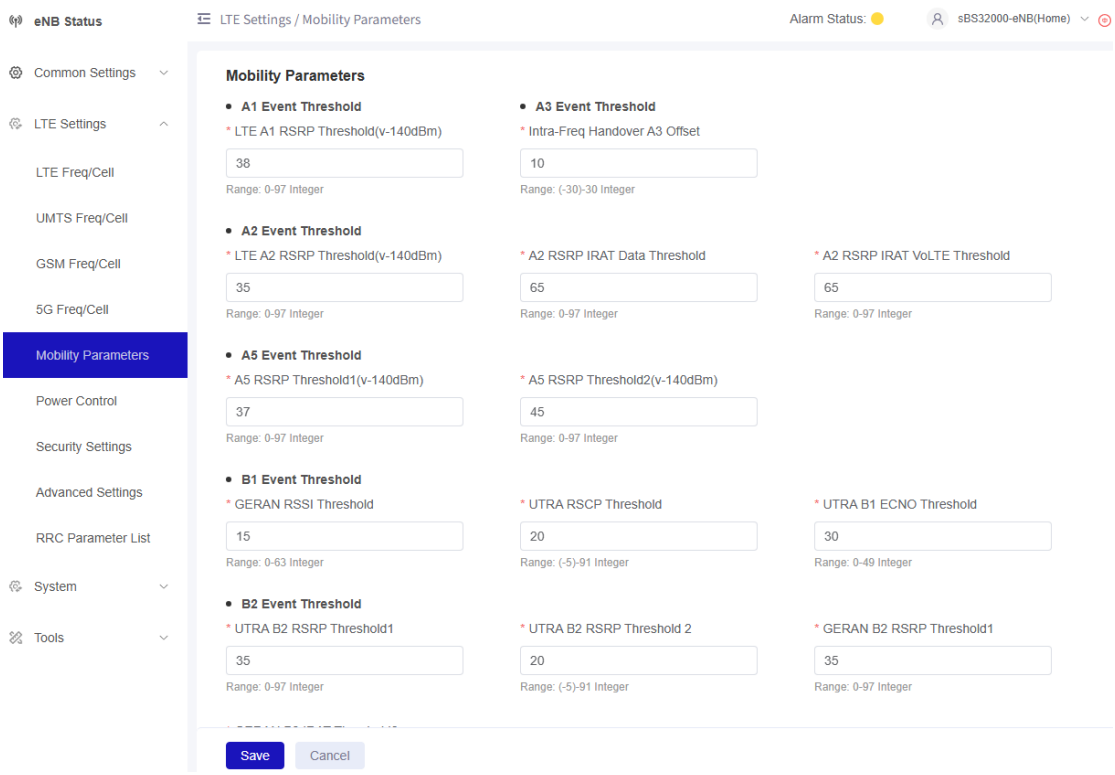
7.5 Configure Mobility Parameter

The *Mobility Parameter* menu pertains to how roaming UE sessions are handled 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 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.

On the left navigation column, select "**LTE Settings > Mobility Parameters**" to enter the mobility parameter configuration page, as shown in Figure 7-5.

Figure 7-5 Mobility Parameters



- 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.

  Input the value of "**LTE A1 RSRP Threshold(v-140dBm)**".

- 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.

  Input the value of "**Intra-Freq Handover A3 Offset**".

- A2 Event Threshold

  The LTE A2 event is triggered when the signal quality of the serving cell is lower than the value of the A2 threshold.

  The A2 event threshold configuration parameters are given in Table 7-9.

Table 7-9 A2 Event Threshold Parameter Description

Parameter	Description
LTE A2 RSRP Threshold(v-140dBm)	When the User Equipment (UE) measures that the Reference Signal Received Power (RSRP) of the serving cell is lower than the set A2 RSRP threshold, the A2 event will be triggered.
A2 RSRP IRAT Data Threshold	RSRP threshold of inter-frequency data service for A2 event.
A2 RSRP IRAT VoLTE Threshold	RSRP threshold of inter-frequency access technology VoLTE service for A2 event.

- 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.

The A5 event threshold configuration parameters are given in Table 7-10.

Table 7-10 A5 Event Threshold Parameter Description

Parameter	Description
A5 RSRP Threshold1 (v-140dBm)	Intra-frequency and inter-frequency RSRP threshold parameter 1 of the A5 event.
A5 RSRP Threshold2 (v-140dBm)	Intra-frequency and inter-frequency RSRP threshold parameter 2 of the A5 event.

- B1 Event Threshold

When the signal quality of the inter-RAT neighbor cell measured by the UE is higher than the preset threshold, the measurement report for the B1 event is triggered.

The B1 event threshold configuration parameters, which descriptions are given in Table 7-11.

Table 7-11 B1 Event Threshold Parameter Description

Parameter	Description
GERAN RSSI Threshold	When the RSSI of a GSM neighbor cell measured by an LTE UE is higher than this threshold, a measurement report for the 2G system is triggered, indicating that the network may consider handover from LTE to GSM. Options: 0~63 integer
UTRA RSCP Threshold	When the RSCP of a WCDMA neighbor cell measured by an LTE UE is higher than this threshold, a measurement report for the 3G system is triggered, indicating that the network may consider handover from LTE to WCDMA. Options: -5~91 integer
UTRA B1 ECNO Threshold	When the ECNO of a WCDMA neighbor cell measured by an LTE UE is higher than this threshold, it means the signal quality of this neighbor cell is sufficient, and the corresponding measurement report is triggered Options: 0~49 integer

- B2 Event Threshold

A measurement report for the B2 event is triggered when both of the following conditions are met simultaneously:

- The signal quality of the LTE serving cell is less than the "Serving Cell Threshold (Threshold1)" (indicating the serving cell is deteriorating).
- The signal quality of the inter-RAT neighbor cell is greater than the "Neighbor Cell Threshold (Threshold2)" (indicating the inter-RAT neighbor cell is sufficiently good).

The B2 event threshold configuration parameters, which descriptions are given in Table 7-12.

Table 7-12 B2 Event Threshold Parameter Description

Parameter	Description
UTRA B2 RSRP Threshold1	When the RSRP of the LTE serving cell is lower than this threshold, it means the signal of the serving cell has deteriorated, satisfying the first trigger condition for the B2 event (deterioration of the serving cell) and providing a basis for subsequent handover to the UTRA (3G) system. Options: 0~97 integer
UTRA B2 RSRP Threshold2	When the RSRP of the UTRA (3G) neighbor cell is higher than this threshold, it indicates that the signal of this inter-RAT neighbor cell is sufficiently good, satisfying the second trigger condition for the B2 event (sufficiently good inter-RAT neighbor cell). Options: -5~91 integer
GERAN B2 RSRP Threshold1	When the RSRP of the LTE serving cell is lower than this threshold, it signifies the deterioration of the serving cell signal, satisfying the first trigger condition for the B2 event and providing a basis for subsequent handover to the GERAN (2G) system. Options: 0~97 integer
GERAN B2 IRAT Threshold2	When the signal quality of the GERAN (2G) neighbor cell (usually referring to RSSI, Received Signal Strength Indicator) is higher than this threshold, it indicates that the signal of this inter-RAT neighbor cell is sufficiently good, satisfying the second trigger condition for the B2 event. Options: 0~63 integer

- 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 evaluates 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 to hand over the session to a neighbor eNB.

The measurement control configuration parameters are given in Table 7-13.

Table 7-13 Measurement Control Parameter Description

Parameter	Description
Hysteresis	This parameter 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 1. 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.
Fc Value	Carrier center frequency
Measurement reporting interval (ms)	The time interval at which the UE reports measurement results to the base station, which is used to control the transmission frequency of measurement reports. If the measurement reporting interval is set too small, it will lead to an increase in reports and consume more air interface resources; if set too large, it may result in excessive handover delay and reduce the handover success rate.

- Cell Selection Parameter

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

The cell selection configuration parameters are given in Table 7-14.

Table 7-14 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. 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.

- Cell Reselection Parameter

When a 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.

The cell reselection configuration parameters are given in Table 7-15.

Table 7-15 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.

Parameter	Description
S-NonIntraSearch	Inter-frequency measurement threshold that must be met before the UE will reselect a neighbor eNB.
Qrxlevmin(dBm)	The minimum level for re-selection. Range is -70 to -22 (integer). In this example, the recommended value is -62 (integer), which means -62*2 = -124 dB.
Qhyst	Delay time for re-selection. 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 that allowed.

- X2 Setting

  The X2 interface configuration parameters are given in Table 7-16.

  Table 7-16 X2 Parameter Description

Parameter	Description
X2	Enable or disable the X2 interface.
X2 Binding	Select an interface having configured. The interface has already been configured in the “6.1.1 Configure WAN/VLAN”.

- Gap Cycle

  The gap cycle parameters are given in Table 7-17.

Table 7-17 Gap Cycle Parameter Description

Parameter	Description
LTE Gap Cycle	The Gap period in an LTE network is 40ms or 80ms.
2G Gap Cycle	The Gap period in an 2G network is 40ms or 80ms.
3G Gap Cycle	The Gap period in an 3G network is 40ms or 80ms.

- ANR Parameters

The ANR configuration parameters are given in Table 7-18.

Table 7-18 ANR Parameter Description

Parameter	Description
Measurement Setting	Select measurement mode. • Auto ANR • Measurement Disable • Periodic • Incident ANR
2/3G ANR Switch	2/3G ANR switch. • Disable • Periodic ANR • Auto ANR
Anr cell valid age	Aging time.
Inter-Freq ANR A5 RSRP Threshold1	If “**Measurement Setting**” is set to “**Incident ANR**”, the parameter displays. The RSRP threshold1 of A5 event.
Inter-Freq ANR A5 RSRP Threshold2	If “**Measurement Setting**” is set to “**Incident ANR**”, the parameter displays. The RSRP threshold2 of A5 event.

Parameter	Description
Intra-Freq ANR A3 Offset	If "**Measurement Setting**" is set to "**Incident ANR**", the parameter displays. The threshold of A3 event.
Max UEs for Periodic ANR Selection	Maximum UEs for periodic ANR selection. Range: 0~512 integer.
Measurement CGI Timer	Timer for Cell Global Identifier (CGI) Measurement. The unit is second. Range: 1~50 integer

- Automatic NRT Neighbor Configuration

  Non-Radio Triggered (NRT) is a kind of neighbor cell. This function does not support in this version.

- Home PCI Range

  The home PCI range configuration parameters are given in Table 7-19.

  Table 7-19 Home PCI Range Parameter Description

Parameter	Description
Home PCI Start	The start PCI. Range is from 0 to 503. When the PCI is in this range, the neighbor type is home eNB, else it is a macro eNB.
Home PCI End	The end PCI.

- UTRAN GERAN Common Parameters

  The UTRAN GERAN common parameters are given in Table 7-20.

Table 7-20 UTRAN GERAN Common Parameter Description

Parameter	Description
Hysteresis	Hysteresis. Range is from 0 to 30.
Time To Trigger	Time To Trigger.
Max Report Cells	Maximum report cells. Range is from 1 to 8 (Integer).
Report Interval	Report Interval
Report Amount	Report Amount
UtraTdd Rscp Threshold	Ultra TDD RSCP threshold. Range is from -5 to 91 (Integer).

- UTRAN B2 Parameters

The UTRAN B2 parameters are given in Table 7-21.

Table 7-21 UTRAN B2 Parameter Description

Parameter	Description
UTRAN B2 RSRP Threshold	Reference Signal Received Power (RSRP) is a key parameter for measuring wireless signal strength. It serves as a threshold for determining the signal strength of the serving cell and inter-system neighboring cells. Range is from 0 to 97 (Integer).
UTRAN B2 RSRQ Threshold	Reference Signal Received Quality (RSRQ) is mainly used to measure the reception quality of reference signals in a specific downlink cell. Range is from 0 to 34 (Integer).
UTRAN B2 RSCP Threshold	Received Signal Code Power (RSCP) is a parameter used to measure cell signal strength in WCDMA networks. Range is from -5 to 91 (Integer).
UTRAN B2 ECNO Threshold	Energy per Chip to Noise Power Spectral Density Ratio (Ec/No) is an important indicator for measuring signal quality in WCDMA networks. Range is from 0 to 49 (Integer).

Parameter	Description
UTRA B2 RSRP HO Data Threshold	In the UTRAN system, it is the Reference Signal Received Power (RSRP) threshold based on which the B2 event handover is triggered during data services.
UTRA B2 RSRP HO VoLTE Threshold	The RSRP handover threshold set for VoLTE services

- GERAN REDIR B2 Parameters

  The GERAN REDIR B2 parameters are given in Table 7-22.

  Table 7-22 GERAN REDIR B2 Parameter Description

Parameter	Description
GERAN B2 REDIR RSRP Threshold	GERAN B2 event REDIR RSRP threshold. Range is from 0 to 97 (Integer).
GERAN B2 REDIR RSRP Threshold	GERAN B2 event REDIR RSRQ threshold. Range is from 0 to 34 (Integer).
GERAN B2 REDIR Threshold2	GERAN B2 event REDIR threshold 2. Range is from 0 to 63 (Integer).

- GERAN IRAT B2 Parameters

  The GERAN IRAT B2 parameters are given in Table 7-23.

  Table 7-23 GERAN IRAT B2 Parameter Description

Parameter	Description
GERAN B2 IRAT RSRP Threshold	GERAN B2 event IRAT RSRP threshold. Range is from 0 to 97 (Integer).
GERAN B2 IRAT RSRP Threshold	GERAN B2 event IRAT RSRP threshold. Range is from 0 to 34 (Integer).

Parameter	Description
GERAN B2 IRAT Threshold2	GERAN B2 event IRAT threshold 2. Range is from 0 to 63 (Integer).

- 5G Function Switch

  The function switch parameters are given in Table 7-24.

  Table 7-24 5G Function Switch Parameter Description

Parameter	Description
GERAN Interoperation Switch	2G interoperation switch. • OFF • Blind Redirection • Redirect • Switch
UTRA Interoperation Switch	2G interoperation switch. • OFF • Blind Redirection • Redirect • Voice Switch • Switch
4G To 5G Ho Enabled	Enable or disable 4G to 5G handover function.
5G To 4G Ho Enabled	Enable or disable 5G to 4G handover function.
4G To 5G Redirect Enabled	Enable or disable 4G to 5G redirection function.
4G To 5G Blind Redirect Enabled	Enable or disable 4G to 5G blind redirect function.

- 5G Measurement Parameters

  The 5G measurement parameters are given in Table 7-25.

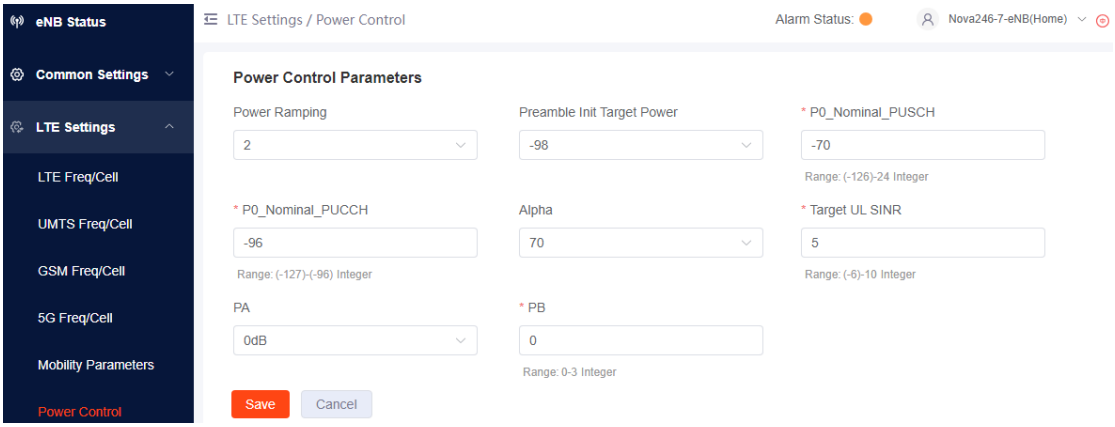
  Table 7-25 5G Measurement Parameter Description

Parameter	Description
5G B1 RSRP Threshold (v-156dBm)	5G B1 event RSRP threshold. Range is from 0 to 127 (Integer).
5G B2 RSRP Threshold1(v-140dBm)	5G B2 event RSRP threshold 1. Range is from 0 to 97 (Integer).
5G B2 RSRP Threshold2(v-156dBm)	5G B2 event RSRP threshold 2. Range is from 0 to 97 (Integer).
5G B2 Hysteresis	5G B2 event hysteresis. Range is from 0 to 30 (Integer).
5G B2 Time To Trigger	5G B2 event trigger time.
5G B2 Max Report Cells	5G B2 event maximum report cells. Range is from 0 to 8 (Integer).
5G B2 Report Interval	5G B2 event report interval.
5G B2 Report Amount	5G B2 event report amount.

7.6 Configure Power Control

On the left navigation column, select "**LTE Settings > Power Control**" to enter the power control parameter configuration page, as shown in Figure 7-6.

Figure 7-6 Power Control



The parameters descriptions are given in Table 7-26.

Table 7-26 Power Control Parameter Description

Parameter	Description
Power Ramping	Step size of the PRACH's power ramping. Range is 0, 2, 4, 6.
Preamble Init Target Power	Initial power of PRACH
P0_Nominal_PUSCH	Physical Uplink Shared Channels (PUSCH) carries user data. It supports Quadrature Phase Shift keying (QPSK) and 16 Quadrature Amplitude Modulation (QAM), with 64QAM being optional. Range is -126 to 24 dB.
P0_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.
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.

Parameter	Description
	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”.

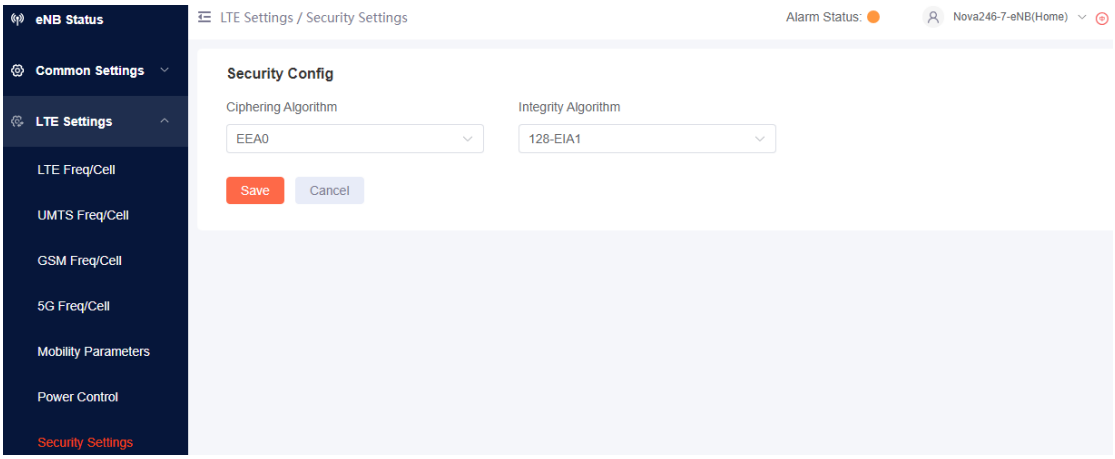
7.7 Configure Security Parameters

CAUTION:

It is not recommended to modify security parameters; please proceed with caution when making changes!

On the left navigation column, select “**LTE Settings > Security Settings**” to enter the security setting page, as shown in Figure 7-7.

Figure 7-7 Security Settings



The parameter descriptions are given in Table 7-27.

Table 7-27 Security Parameter Description

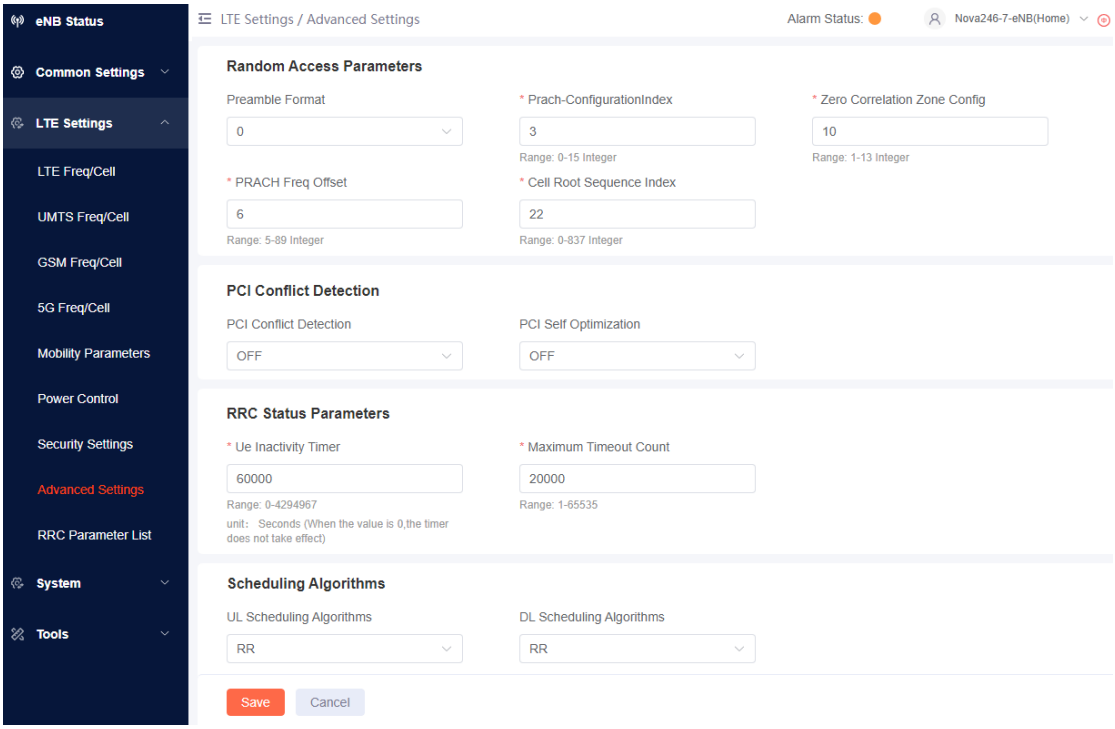
Parameter	Description
Ciphering Algorithm	Encryption algorithm

Parameter	Description
	• EEA0（recommended） • 128-EEA1 • 128-EEA2
Integrity Algorithm	Integrity protection algorithm • 128-EIA1 • 128-EIA2

7.8 Configure Advanced Parameters

On the left navigation column, select "**LTE Settings > Advanced Settings**" to enter the advanced parameter configuration page, as shown in Figure 7-8.

Figure 7-8 Advanced Settings



- Random Access Parameters

Random access configuration parameters are given in Table 7-28.

Table 7-28 Random Access Parameter Description

Parameter	Description
Preamble Format	The preamble format when UE random accesses. • 0: send PRACH on normal subframe, the farthest covered distance is 14km.
Prach-ConfigurationIndex	PRACH configuration index, broadcasted to the UE via SIB2. Range is from 0 to 15.
Zero Correlation Zone Config	PRACH cycle shift, used to generate the preamble sequence. Range is from 1 to 13.
PRACH Freq Offset	Set the frequency offset range, the value range is determined by the bandwidth of the quick Settings page. • If the bandwidth is 5MHz, the range is 3-16. • If the bandwidth is 10MHz, the range is 4-40. • If the bandwidth is 15MHz, the range is 4-64. • If the bandwidth is 20MHz, the range is 5-89.
Cell Root Sequence Index	The index of root sequence. Range: 0-837

- PCI Conflict Detection

The PCI conflict detection configuration parameters are given in Table 7-29.

Table 7-29 PCI Conflict Detection Parameter Description

Parameter	Description
PCI Conflict Detection	Enable or disable the PCI conflict detection function.
PCI Self Optimization	Enable or disable the PCI self-optimization function.

- RRC Status Parameters

The RRC status configuration parameters are given in Table 7-30.

Table 7-30 RRC Status Parameter Description

Parameter	Description
Ue Inactivity Timer	Expire time of the UE inactive status timer (s)
Maximum Timeout Count	Maximum number of the UE inactive status timer's expiries

UE inactive status duration = RRC Inactive Timer * Max Expiry Count

- Scheduling Algorithms

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.

- RR algorithm

  Allocate the resource and opportunities to all terminals equally. QoS does not be taken into account, and memory not used.

- PFS algorithm

  The user channel quality and fairness are considered comprehensively between cell throughput and user fairness.

- QoS algorithm

  Different QoS is provided for different data bearer categories. Each data bearer category is associated with a QoS class identifier (QCI).

Scheduling algorithm configuration parameters are given in Table 7-31.

Table 7-31 Scheduling Algorithms Parameter Description

Parameter	Description
UL Scheduling Algorithms	MAC uplink scheduling algorithm. Qos PFS and RR are supported. Default: RR

Parameter	Description
DL Scheduling Algorithms	MAC downlink scheduling algorithm. PFS and RR are supported. Default: RR

- Cell CSFB Select

  Select circuit switched fallback to GSM or UMTS network.

- RF 1T2R Setting

  Enable or disable the RF 1T2R switch.

- Sync Adjust Parameter

  Input the value of “Frame Offset”. The unit is ns.

- Link Activation Status Detection

  The link activation state detector configuration parameters are given in Table 7-32.

Table 7-32 Link Activation State Detection Parameter Description

Parameter	Description
Keeping The Link Alive	Enable or disable the link keeping alive function. • ON: If the link connection of WAN interface disconnects, the eNB triggers the link keep-alive timer. After the timer expires, the eNB reboots automatically. • OFF: The eNB does not detect the state of WAN interface.
Link Keep-alive Timer	When “**Keeping The Link Alive**” is set to “**ON**”, set the timer. • 5 minutes • 10 minutes • 15 minutes

- Load Balancing Setting

Load balancing configuration parameters among eNBs are given in Table 7-33.

Table 7-33 Load Balancing Parameter Description

Parameter	Description
Inter Station Load Balancing Switch	Enable or disable load balancing function between eNBs. • OFF • UE Count Load Balancing Mode • Uplink Traffic Load Sharing Mode
Load Balancing Threshold	If “Inter Station Load Balancing Switch” is set to “UE Count Load Balancing Mode”, this parameter displays. Load balancing threshold. Range is from 0 to 128 (integer).
Effective Difference	If “Inter Station Load Balancing Switch” is set to “UE Count Load Balancing Mode”, this parameter displays. Effective difference. Default is 0. Range is from 0 to 128 (integer).
Destination Station Address	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode” or “UE Count Load Balancing Mode”, the destination station address is needed.
Master-Slave Mode	Select master mode or slave mode.
TDD Cell UE Uplink Traffic Max Threshold	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode”, this parameter displays. Max threshold of UE uplink traffic for TDD cell.
FDD Cell UE Uplink Traffic Min Threshold	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode”, this parameter displays. Min threshold of UE uplink traffic for FDD cell.
TDD Cell Statistics Period	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode”, this parameter displays.

Parameter	Description
	Statistics period for TDD cell.
FDD Cell Statistics Period	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode”, this parameter displays. Statistics period for FDD cell.
UL PRB Utilization Threshold	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode”, this parameter displays. PRB utilization threshold for uplink.
DL PRB Utilization Threshold	If “Inter Station Load Balancing Switch” is set to “Uplink Traffic Load Sharing Mode”, this parameter displays. PRB utilization threshold for downlink.

- Working Mode

  Select the maximum UEs accessed the eNB, including 32UE, 64UE ,96UE, 128UE, and 256UE. The actual number of accessed UEs cannot exceed the maximum value set here.

- UL 64QAM Settings

  Enable or disable uplink 64QAM.

- DL 256QAM Settings

  Enable or disable downlink 256QAM.

- Performance Optimization

  Performance optimization parameters are given in Table 7-34.

Table 7-34 Performance Optimization Parameter Description

Parameter	Description
Target BLER	Select target Block Error Rate (BLER) • 3% (1:33) • 5% (2:40)

Parameter	Description
	• 10% (3:30)
UL SINR	Uplink Signal to Interference plus Noise Ratio (SINR) Range from -6 to 10.
Ping Packet Delay Optimization	Enable or disable the ping packet delay optimization function.
Dynamic UE/TTI Scheduling	Enable or disable the dynamic scheduling UE function
Dynamic UL Target SINR	Enable or disable the dynamic uplink target SINR function.
Uplink Prescheduling	Enable or disable the uplink prescheduling.
Single UE Peak Throughput	Peak throughput of single UE. Range from 0 to 3.

- ICIC parameters

  Enable or disable the Soft Frequency Reuse (SFR) switch.

- Transfer Mode

  Set transfer mode to “TM2” or “TM3”.

- QCI Scheduling Parameters

  QCI scheduling parameters are given in Table 7-35.

Table 7-35 QCI Scheduling Parameter Description

Parameter	Description
Weight Scheduling Switch	Enable or disable the weight scheduling function.
QCI6 Weight	QCI6 Weight
QCI7 Weight	QCI7 Weight

Parameter	Description
QCI8 Weight	QCI8 Weight
QCI9 Weight	QCI9 Weight

- CellDt

  Celldt is a TTI-level log recording tool that supports different types of log recording. This configuration takes effect in real time and reverts to the default configuration after the base station is restarted

  Celldt configuration parameters are given in Table 7-36.

  Table 7-36 Celldt Parameter Description

Parameter	Description
Switch	Celldt switch.
Type	Parameter type. This version only supports “Set tti trace num”.
Value	• 0: Cell1 • 1: Cell2 • 65535: All cells.
Trace No	Trace No. Multiple trace Numbers are supported, separated by ‘/’.

- AMBR Setting

  AMBR (Aggregate Maximum Bit Rate) applies only to Non-GBR (Non-Guaranteed Bit Rate) bearers. Multiple SAE (System Architecture Evolution) bearers of the same User Equipment (UE) can share the same AMBR. Once the data traffic exceeds the threshold set by AMBR, the network may adopt service traffic adjustment algorithms for regulation on the uplink or downlink to ensure smooth network transmission.

  AMBR configuration parameters are given in Table 7-37.

Table 7-37 AMBR Setting Parameter Description

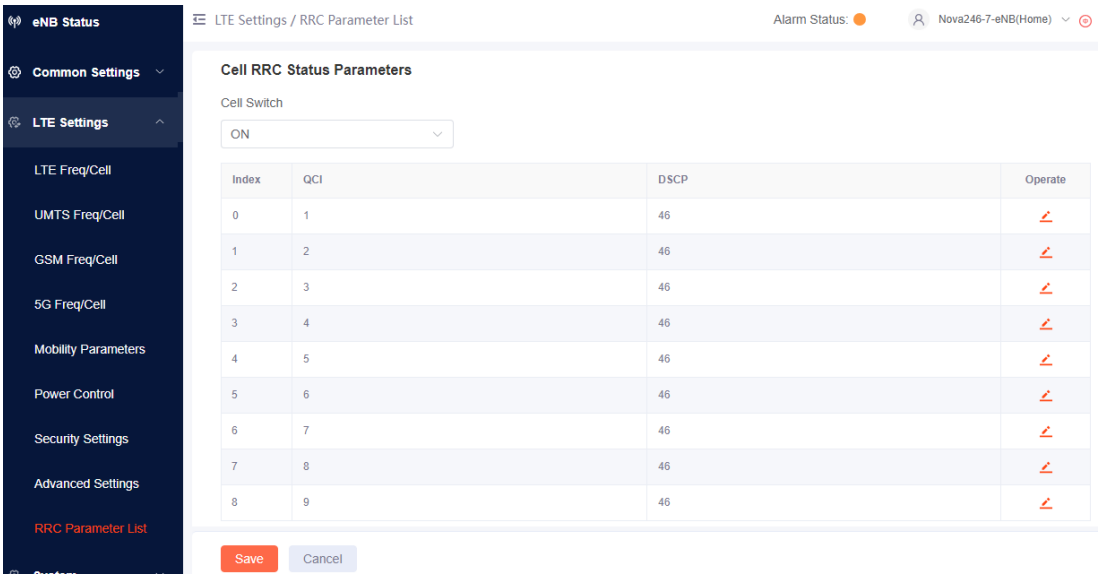
Parameter	Description
AMBR Limit Switch	Enable or disable AMBR limit.
DL AMBR	When “AMBR Limit Switch” is set to “ON”, this parameter displays. Downlink AMBR threshold.
UL AMBR	When “AMBR Limit Switch” is set to “ON”, this parameter displays. Uplink AMBR threshold.

7.9 Configure RRC Status Parameters

This function is used for control bearer Qos parameter of every QCI level.

1. On the left navigation column, select “**LTE Settings > RRC Parameter List**” to enter the RRC status parameters page, as shown in Figure 7-9.

Figure 7-9 RRC Status Parameter



2. Select whether to enable the cell switch.

3. Click to display the Multi-Operator Core Network (MOCN) configuration parameters, as shown in Table 7-38.

Table 7-38 RRC Status Parameter Description

Parameter	Description
Index	Index of RRC.
QCI	QCI level. Range is from 1 to 9.
DSCP	DSCP value. 0-63 Range from 0 to 63.

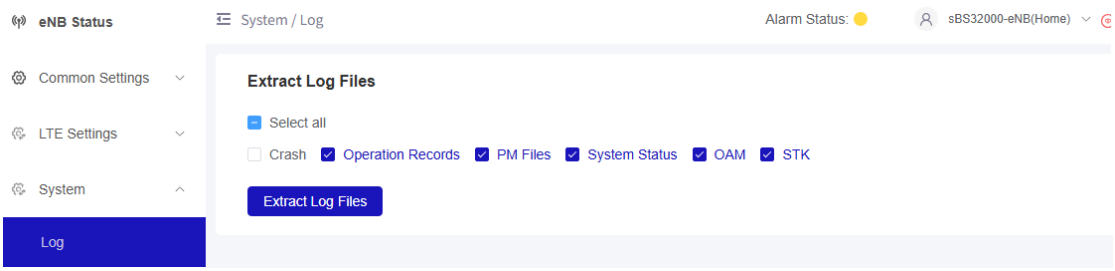
4. Click "**Save**" to complete the setting of the RRC status parameters.

8. System

8.1 Configure Log

In the navigation column on the left, select "**System > Log**" to enter the log setting page, as shown in Figure 8-1.

Figure 8-1 Log



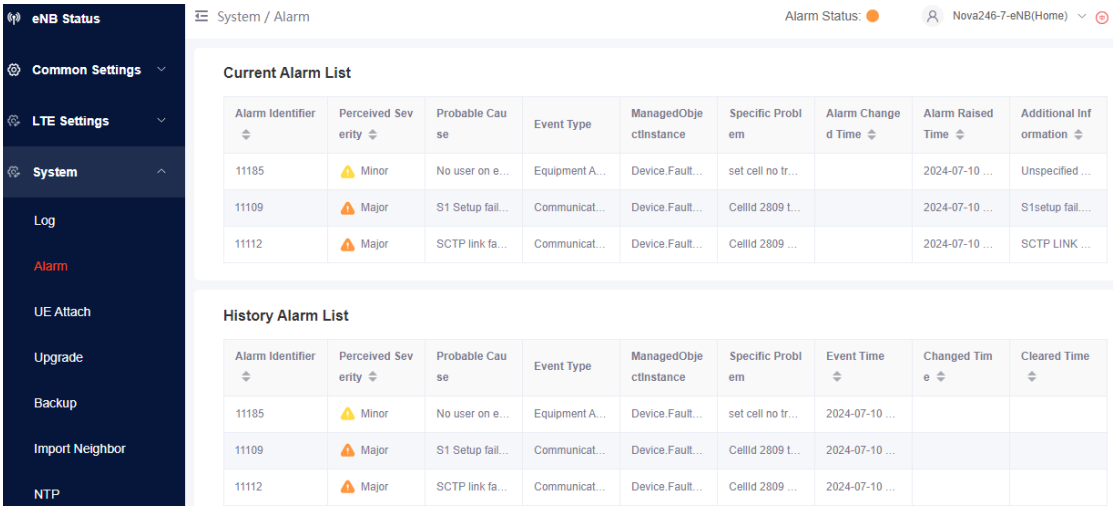
Select log type, then click "**Extract Log Files**" to save the log files to the local computer.

8.2 View Alarm

The *Alarm* menu supports the viewing of current alarms and history alarms.

In the navigation column on the left, select "**System > Alarm**" to enter the alarm view page, as shown in Figure 8-2.

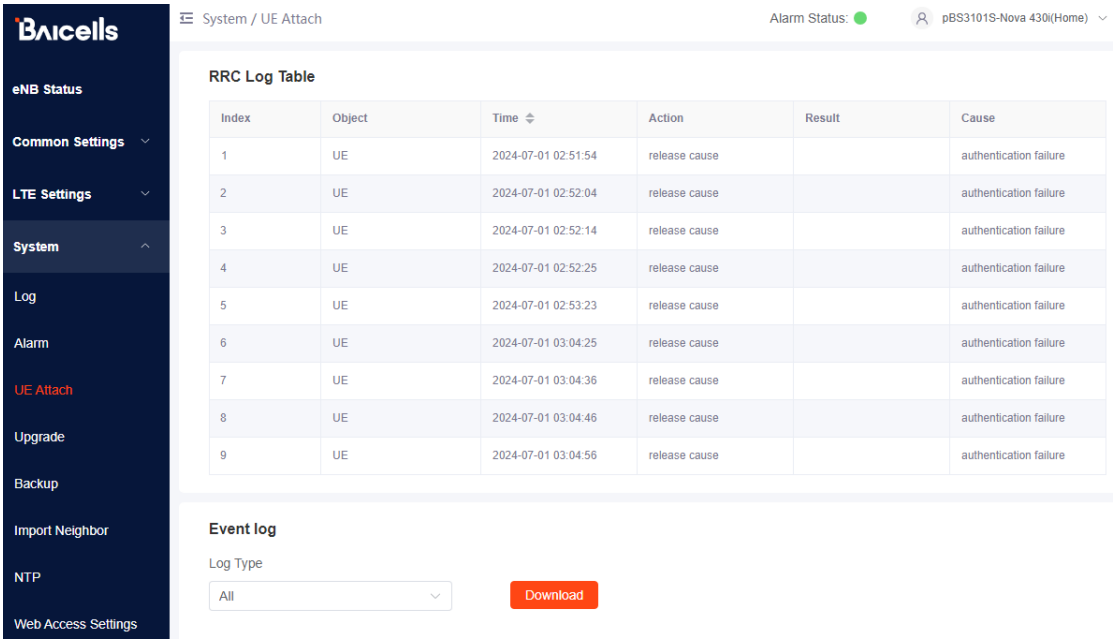
Figure 8-2 Alarm



8.3 UE Attach

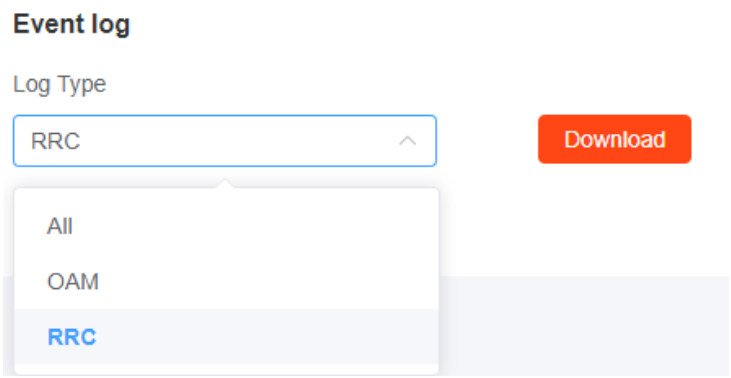
In the navigation column on the left, select "**System > UE Attach**" to enter the UE attach view page, as shown in Figure 8-3.

Figure 8-3 UE Attach



Select a log type from the dropdown list of "Log Type", as shown in Figure 8-4.

Figure 8-4 Select "Event Log" Type



Click "Download" to download the logs to the local computer.

8.4 Upgrade

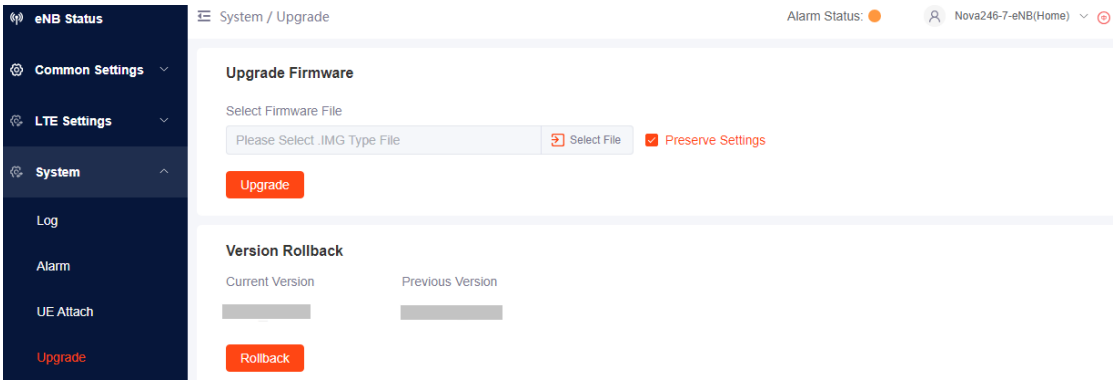
When the preset version does not meet the actual need, the software version needs to be updated the latest version. The system supports the firmware version upgrade and rollback.

CAUTION:

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

In the navigation column on the left, select "**System > Upgrade**" as shown in Figure 8-5.

Figure 8-5 Upgrade Firmware



8.4.1 Upgrade Firmware

1. The operator gets the firmware file of new version and saves it in local computer.
2. Select whether to "preserve settings".
3. Click "**Select File**" to select the firmware file.

   NOTE: The file type is *.IMG.
4. Check whether the software version is correct again, and then click "**Upgrade**".
5. In the pop-up window click "**Confirm**".

   Wait for about three minutes, the eNB will reboot completely.

In the eNB Status page (home page), the upgraded version will be shown in "**Software Version**".

8.4.2 Version 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 upgrading.

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 "**Rollback**".
2. In the pop-up window click "**Confirm**".

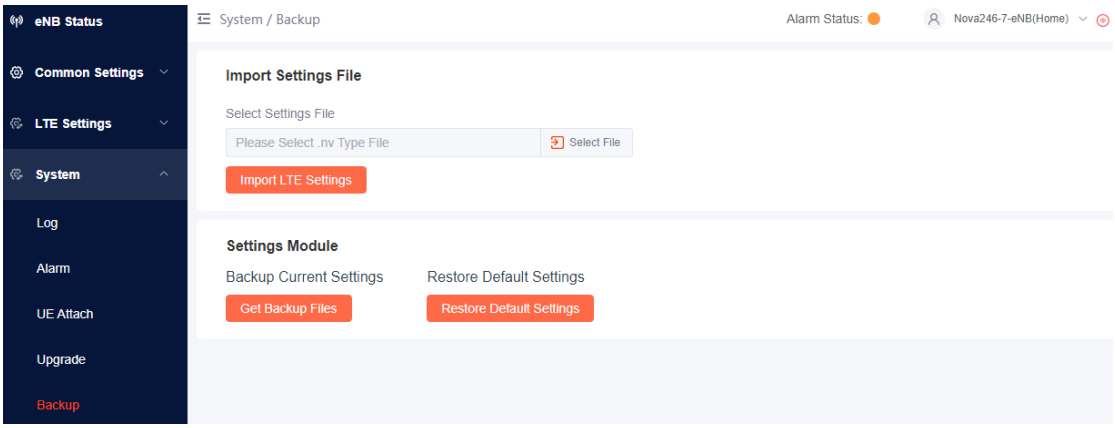
   Wait for about three minutes, the eNB will reboot completely.

   In the eNB Status page (home page), the upgraded version will be shown in "**Software Version**".

8.5 Backup

In the navigation column on the left, select "**System > Backup**" to enter the backup page, as shown in Figure 8-6.

Figure 8-6 System Backup



- Import Configuration File

ATTENTION:

After the restore operation, the eNB will reboot immediately. Be careful to operate the "**Restore Default Setting**" to restore.

Click "**Select File**" to select the configuration file from the local computer, and then click "**Import LTE Setting**" to import the configuration file.

- Backup Current Configuration

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

- Restore Default Configuration

ATTENTION:

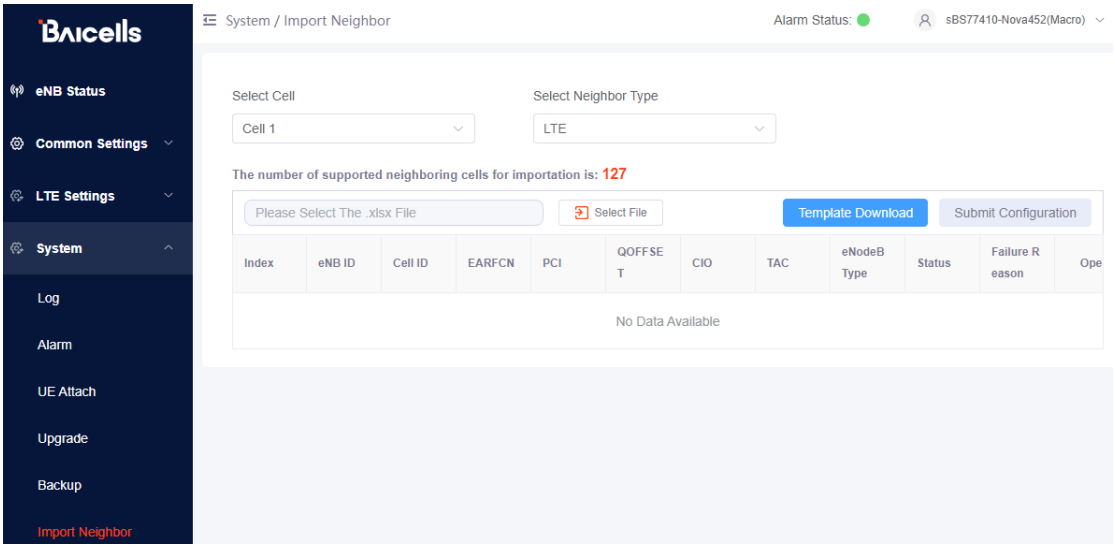
After the restore operation, the eNB will reboot immediately. Be careful to operate the "**Restore Default Setting**" to restore.

Click "**Restore Default Setting**" to reboot immediately.

8.6 Import Neighbor

1. In the navigation column on the left, select "**System > Import Neighbor**" to enter the neighbor cell batch importing page, as shown in Figure 8-7.

Figure 8-7 Import Neighbor



2. Select cell.

   For the single carrier mode, there is only one cell.

3. Select Neighbor Type. Options are LTE, GSM, and NR.

4. Click “Template Download”.

5. Modify the information of neighbor cells in the template according to actual networking. The parameters refer to “7.1 Configure LTE Neighbor Frequency and Cell”, to “7.4 Configure 5G Neighbor Frequency and Cell”.

   NOTE: Before importing neighbor cells, make sure that corresponding neighbor frequencies have been added.

6. Click “Select File” to select the template.

7. Click “Import Neighbor” to import neighbor cells.

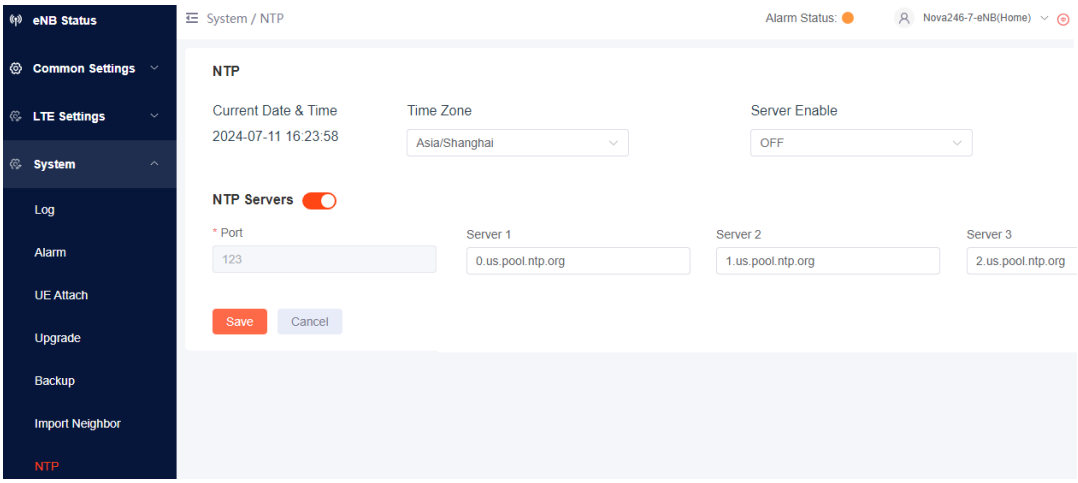
   The import results will be displayed on the lower part of the page. If importing is failed, you can modify the configuration and do this step again.

8.7 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 three NTP servers are supported, where one for master NTP service and the others for backup.

1. In the navigation column on the left, select “**System > NTP**” to enter the NTP setting page, as shown in Figure 8-8.

Figure 8-8 NTP Server Setting



2. Select Time Zone that the eNB is located.

3. Select enable or disable the NTP server function.

4. Move the slider for "NTP Servers" to the right to display the server configuration parameters, the parameter description is given in Table 8-1.

Table 8-1 NTP Server Parameter Description

Parameter	Description
Port	Port number of the master NTP server. Must be consistent with the other end.
Server1	Domain name or IP address of the master NTP server. Must be consistent with the other end.
Server2	Domain name or IP address of the slave NTP server. Must be consistent with the other end.
Server3	Domain name or IP address of the slave NTP server. Must be consistent with the other end.

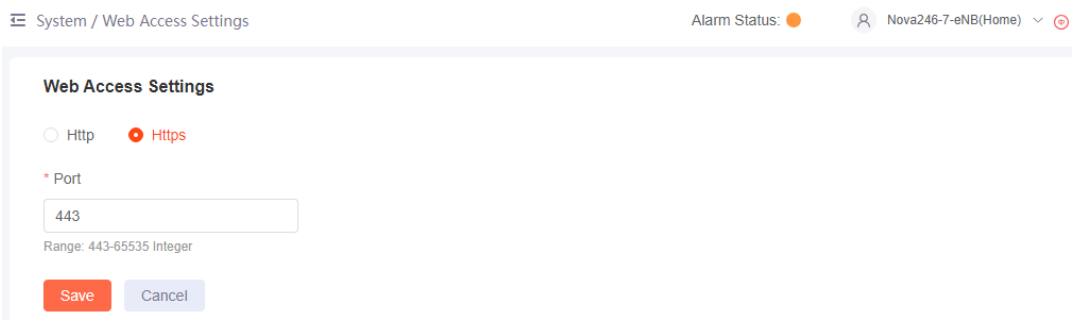
5. Click “**Save**” to complete the NTP server configuration.

8.8 Web Access Settings

This menu describes how to enable SSH and change the login port of the LMT. Default is 443. If there is any conflict in the network, the port can be changed. After changing the port, the login URL must add the port number: HTTPS:// <IP address>:<port number>.

1. In the navigation column on the left, select "**System > Web Access Settings**" to enter the web access setting page, as shown in Figure 8-9.

Figure 8-9 Web Access Setting



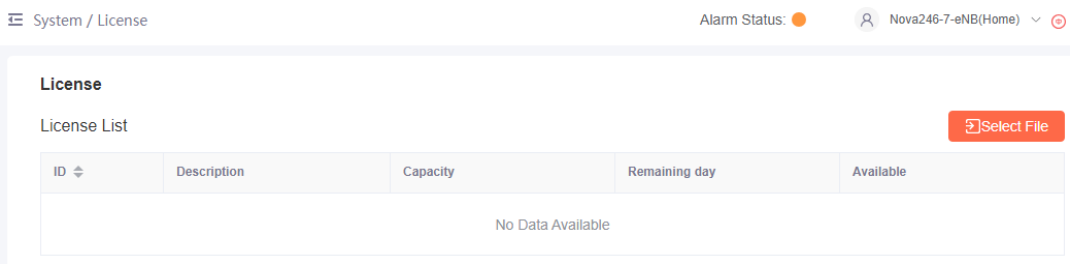
2. Select the web access method is Http or HTTPS.
3. Input a new port.
4. Click "**Save**" to complete the web access setting.

8.9 License

The *License* 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.

1. In the left navigation column, select "**System > License**" to enter the License management page, as shown in Figure 8-10.

Figure 8-10 License Management



2. Click "**Select File**" to upload the license file to the eNB.

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

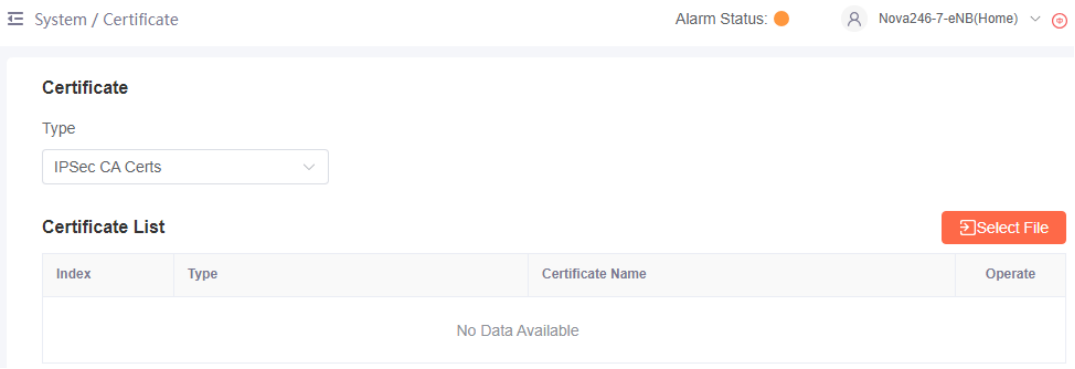
8.10 Certificate

The eNB support to upgrade and manage IPsec CA certification, IPsec equipment certification, and IPsec private, etc.

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

1. Select "**System > Certificate**" to enter the certificate management page, as shown in Figure 8-11.

   Figure 8-11 Certificate



   NOTE: For IPsec related certificates, you can also check in "6.1.2 Configure IPsec".

2. Select certificate type.

3. Click "**Select File**", select certificate from local computer to upload the certificate

file to the eNB.

8.11 Reboot

 **Caution：**

The reboot operation will interrupt the current service of the base station, be careful to operate this operation.

1. On the left navigation, select “**System > Reboot**” to enter the reboot page.
2. Click “**Reboot**” to reboot the eNB immediately.

   Wait for three to five minutes, the eNB will restart completely. After the eNB reboots, it is recommended to modify the time setting.

9. Tools

9.1 Spectrum Analyzer

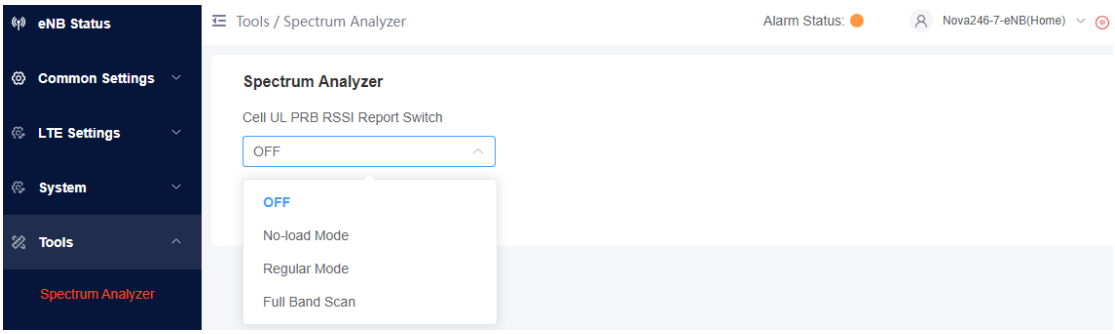
The UL Physical Resource Block (PRB) Received Signal Strength Indicator (RSSI) Report feature may be used when you think you have an interference issue. RSSI measures the total received wideband power, including noise. When you run this report, the eNB looks for UE subframes not being used (no PRBs assigned,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

CAUTION:

Enable the function will interrupt services. Please be careful when performing this operation.

In the left navigation column, select "**Tools > Spectrum Analyzer**" to enter the spectrum analyzer configuration page, as shown in Figure 9-1.

Figure 9-1 Spectrum Analyzer



The eNB provides three types of mode.

- No-load mode
- Regular mode
- Full band mode

If you choose one type of mode, the page will display the graph of UL PRB RSSI, as shown in Figure 9-2.

Figure 9-2 UL PRB RSSI Graph

The report will display a graph in real-time at the lower-half 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 – ANT0 and ANT1. Only 20MHz of bandwidth can be detected at one time.

9.2 Signaling Trace

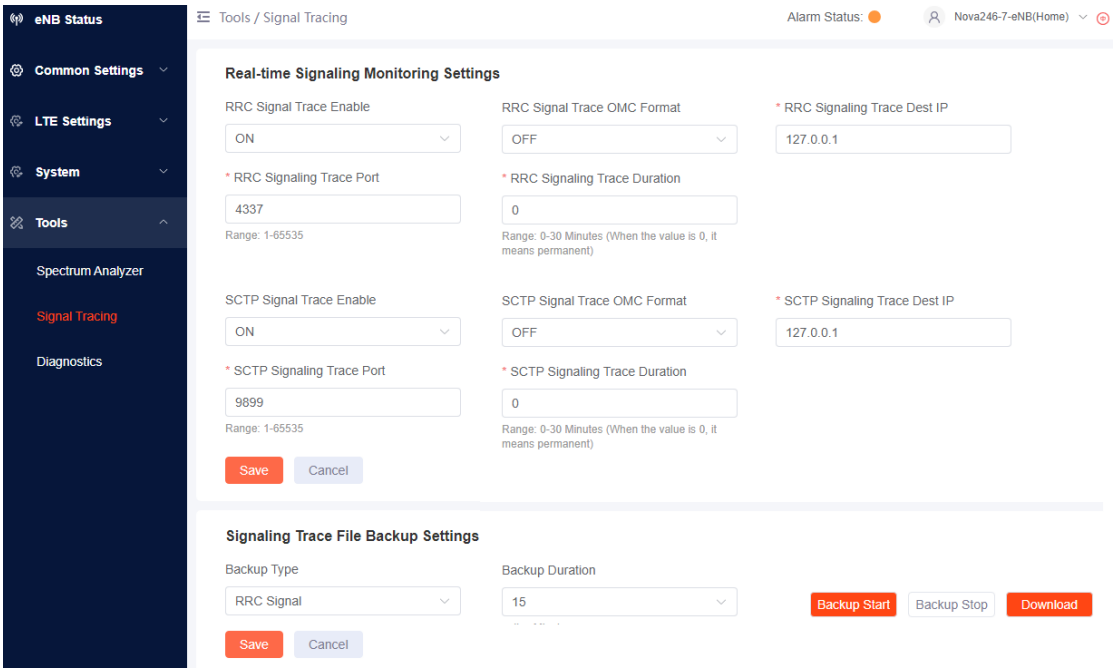
The *Signaling Trace* function is typically used for troubleshooting UE attachment and handover issues. During a signaling trace, RRC and SCTP packets are captured in real-time. The packets are sent to a remote computer running Wireshark or a Local OMC and displayed so the data can be analyzed.

The RRC protocol controls the UE and eNB over-the-air communications, then 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 Evolved Packet System (EPS) bearer setup/modification/release, handover procedures, Non-Access Stratum (NAS) signaling transport, and paging procedures.

9.2.1 Real-time Signaling Monitor Setting

1. In the left navigation column, select "**Tools > Signal Tracing**" to enter the signaling trace configuration page, as shown in Figure 9-3.

Figure 9-3 Signaling Trace



2. Input the signaling trace parameters, which descriptions are given in Table 9-1.

Table 9-1 Signaling Trace Parameter Description

Parameter	Description
RRC Signal Trace Enable	Enable or disable the RRC signaling trace function.
RRC Signal Trace OMC Format	Enable or disable sending the RRC signaling trace data to the local OMC. If the signaling trace is exported to the OMC, the parameter needs to be configured.
RRC Signaling Trace Dest IP	The IP address of the computer where RRC signaling trace data will be sent. The IP address must be communicated with the eNB. Default is 127.0.0.1, which should be changed.
RRC Signaling Trace Port	The port number of the computer where RRC signaling trace data will be sent. Range is 0 to 65535. Default is 4337.

Parameter	Description
	NOTE: For MAC computer, if there is an existing MAC packet (directory), make sure you use a different port number for the RRC packet.
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 Signal Trace Enable	Enable or disable the computer where SCTP signaling trace function.
SCTP Signal Trace OMC Format	Enable or disable sending the SCTP signaling trace data to the local OMC. If the signaling trace is exported to the OMC, the parameter needs to be configured.
SCTP Signaling Trace Dest IP	The IP address of the computer where the SCTP signaling trace data will be sent. The IP address must be communicated with the eNB. Default is 127.0.0.1, which should be changed.
SCTP Signaling Trace Port	The port number of the computer where the SCTP signaling trace data will be sent. Range is 0 to 65535. Default is 9899.
SCTP Signaling Trace Duration	The duration of the SCTP signaling trace. Range is 0 to 30 minutes. A value of zero (0) means continuous.

3. Click “**Save**” to complete the signaling trace setting.

9.2.2 Signaling Trace File Backup Setting

1. In “**Signaling Trace File Backup Setting**” area, the descriptions are given in Table 9-2.

Table 9-2 Signaling Trace File Backup Parameter Description

Parameter	Description
Backup Type	Signaling tcpdump type • RRC signal • SCTP signal • RRC and SCTP signal
Backup Duration	Signaling backup time. The unit is minute. • 5 • 10 • 15 • 30

2. Click “**Save**” to complete the signaling trace file backup setting.

   - Start Backup: Click "Start Backup" to begin the backup process according to the backup settings.
   - Stop Backup: Click "Stop Backup" to halt the backup operation.
   - Download: Click "Backup File Download" to download the backup file to your local machine.

9.3 Diagnostics

The eNB supports three types of network diagnosis methods.

- Ping

  Ping command is used to check whether the network connection from the eNB to the destination IP address is normal.

- TraceRoute

  Trace route command is used to detect the routing information between the eNB and the destination IP address.

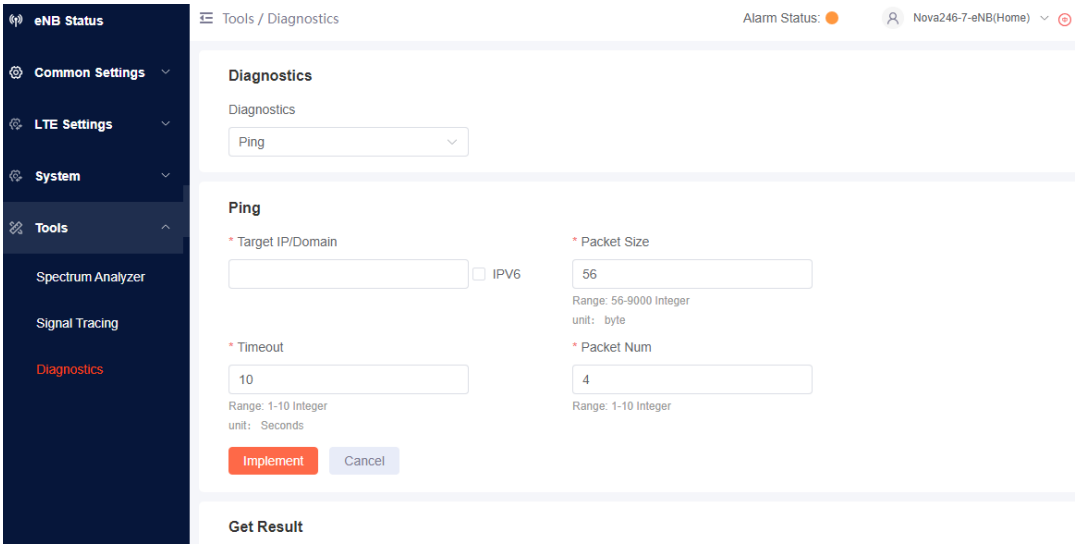
- Iperf3

  Iperf3 command is used to check the network performance.

In the navigation column on the left, select "**Tools > Diagnostics**" to enter the diagnostics page. For different diagnosis methods, the parameters are different, following introduce three types of diagnosis method separately.

- "Diagnostics Method" is set to "Ping", the configuration parameters are shown in Figure 9-4.

Figure 9-4 Diagnostics – Diagnostics Method is Ping



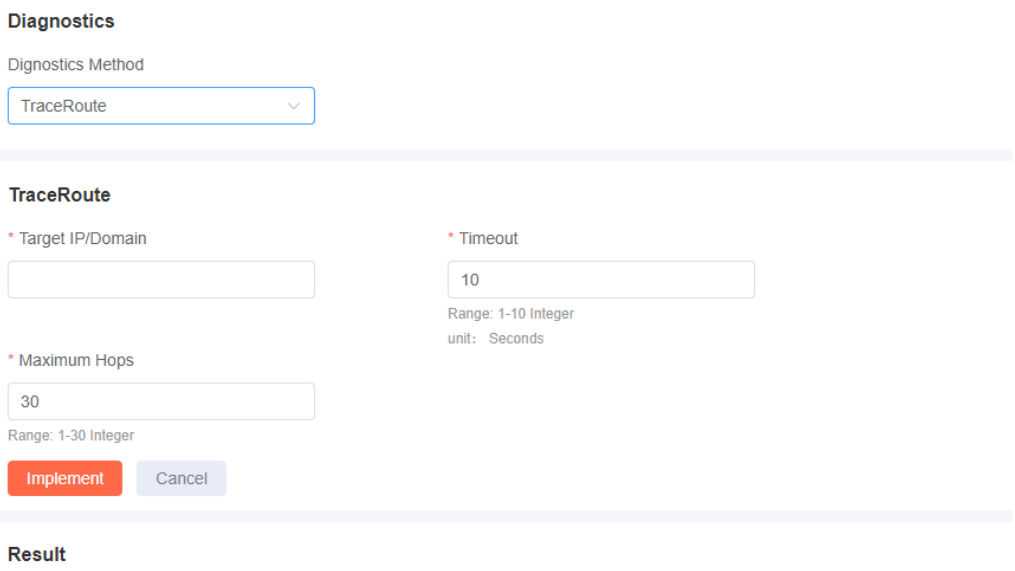
The ping parameter description is given in Table 9-3.

Table 9-3 Ping Parameter Description for Diagnostics

Parameter	Description
Target IP/Domain	The IP address or domain name of the destination. Enable or disable IPV6 switch.
Packet Size	The size of the packet.
Timeout	Set the timeout period. The unit is second. Range is from 0 to 10.
Packet Num	The number of the packet. Range is from 0 to 10.

- “Diagnostics Method” is set to “TraceRoute”, the configuration parameters are shown in Figure 9-5.

Figure 9-5 Diagnostics – Diagnostics Method is TraceRoute



The trace route parameter description is given in Table 9-4.

Table 9-4 TraceRoute Parameter Description for Diagnostics

Parameter	Description
Target IP/Domain	The IP address or domain name of the destination.
Timeout	Set the timeout period.
Maximum Hops	The maximum hops.

- “Diagnostics Method” is set to “Iperf3”, the configuration parameters are shown in Figure 9-6 and Figure 9-7.

Figure 9-6 Diagnostics – Diagnostics Method is Iperf3 (Server)

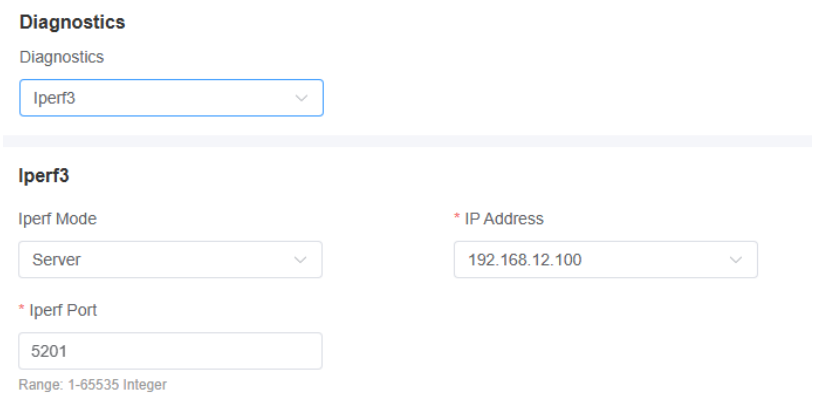
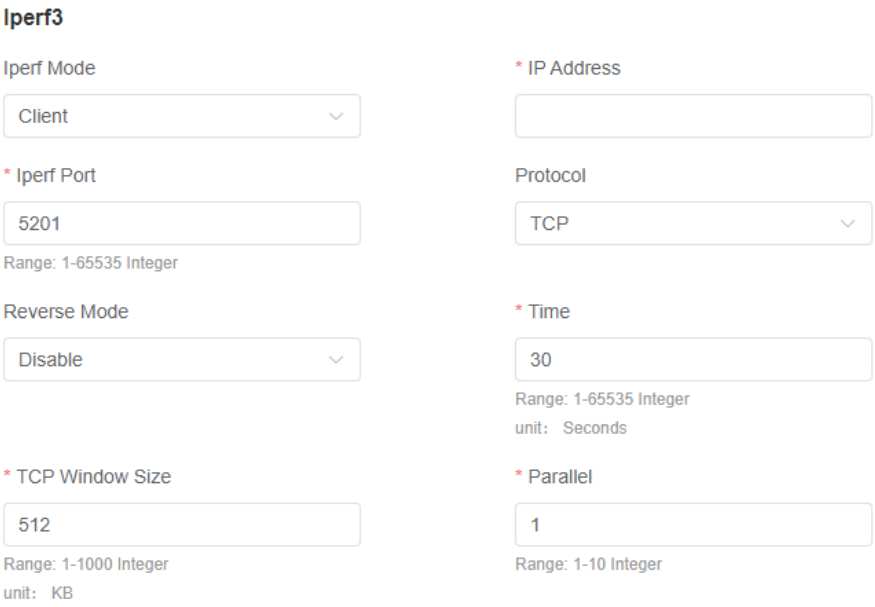


Figure 9-7 Diagnostics – Diagnostics Method is Iperf3 (Client)



The Iperf3 parameter description is given in Table 9-5.

Table 9-5 Iperf3 Parameter Description for Diagnostics

Parameter	Description
Iperf Mode	Iperf Mode is set to client or server.
Iperf IP Address	IP Address of Iperf used.
Iperf Port	Port of Iperf used.
Protocol	When “Iperf Mode” is set to “Client”, this parameter displays.

Parameter	Description
	The protocol used by the client. • TCP • UDP
Reverse Mode	When “Iperf Mode” is set to “Client”, this parameter displays. Enable or disable reverse flow switch.
Time	When “Iperf Mode” is set to “Client”, this parameter displays. Time. The unit is second. Range is from 1 to 65535.
TCP Window Size	When “Iperf Mode” is set to “Client” and “Protocol” is “TCP”, this parameter displays. The size of the TCP window. The unit is KB. Range is from 1 to 1000.
Parallel	When “Iperf Mode” is set to “Client” and “Protocol” is “TCP”, this parameter displays. Parallel TCP. Range is from 1 to 10.
Socket Buffer Size	When “Iperf Mode” is set to “Client” and “Protocol” is “UDP”, this parameter displays. The size of socket buffer. The unit is byte. Range is from 700 to 1600.
Bandwidth	When “Iperf Mode” is set to “Client” and “Protocol” is “UDP”, this parameter displays. Bandwidth. The unit is Mbit/s. Range is from 1 t0 1000.

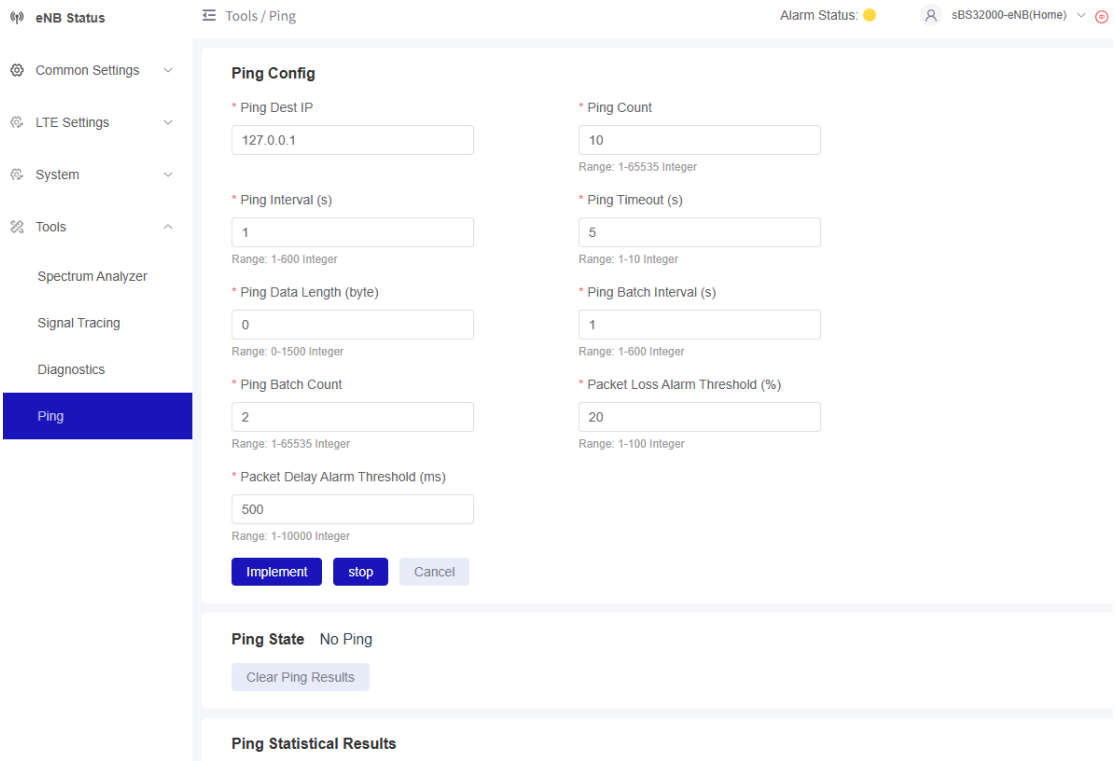
After above parameters are configured, click “**Implement**”. The diagnostics result is shown in the lower part of the screen.

Click “**Stop**” to stop Iperf3 detection.

9.4 Ping

Select “**Tools > Ping**” to enter the png operation configuration page, as shown in Figure 9-8.

Figure 9-8 Configure Ping



Input the configuration parameters of ping function, which are given in Table 9-6.

Table 9-6 Ping Operation Parameter Description

Parameter	Description
Ping Dest IP	The destination IP address of ping opertion.
Ping Count	Number of packets per batch. Range: 1 to 65535.

Parameter	Description
Ping Interval (s)	Interval of ping. Range: 1 to 600.
Ping Timeout (s)	Overtime of ping. Range: 1 to 10.
Ping Data Length (byte)	Length of ping package. Range: 0 to 65535.
Ping Batch Interval (s)	Interval of every batch. Range: 1 to 65535.
Ping Batch Count	Count of batch. Range: 0 to 65535.
Packet Loss Alarm Threshold (%)	Alarm threshold of packet loss. Range: 1 to 100.
Packet Delay Alarm Threshold (ms)	Alarm threshold of packet delay. Range: 1 to 65535.

In the lower half of the window, you can view the ping result, ping summary and ping state, as shown in Figure 9-9.

Figure 9-9 Ping Results

Ping Statistical Results

Index	maxPacket Loss (%)	minPacket Loss (%)	avgPacket Loss (%)	maxPacket TTL	minPacket TTL	avgPacket TTL	maxPacket Delay (ms)	minPacket Delay (ms)	avgPacket Delay (ms)
0	0	0	0	0	0	0	0.00	0.00	0.00

Last 10 Statistical Results

Index	maxPacket TTL	minPacket TTL	avgPacket TTL	maxPacket Delay (ms)	minPacket Delay (ms)	avgPacket Delay (ms)	Packet Loss (%)	Report Time
0	0	0	0	0.00	0.00	0.00	0	
1	0	0	0	0.00	0.00	0.00	0	
2	0	0	0	0.00	0.00	0.00	0	
3	0	0	0	0.00	0.00	0.00	0	
4	0	0	0	0.00	0.00	0.00	0	
5	0	0	0	0.00	0.00	0.00	0	

Click “Clear Ping Results” to clear the results of ping operation.

Appendix A Terminology & Acronym

Acronym	Full Name
AGL	Above Ground Level
AMBR	Aggregate Maximum Bit Rate
ARP	Address Resolution Protocol
BLER	Block Error Rate
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

Acronym	Full Name
IPsec	Internet Protocol Security
MME	Mobility Management Entity
MOCN	Multi-Operator Core Network
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	Soft Frequency Reuse

Acronym	Full Name
SINR	Signal to Interference plus Noise Ratio
SON	Self-Organized Network
SNR	Signal-to-Noise Ratio
SSH	Secure Shell
TAC	Tracking Area Code