NeutrinoE224

Indoor 2x125mW eNB

User Manual

Document version: 04

About This Document

This document introduce NeutrinoE224 TDD/FDD indoor base station, and guides users to install and quick setting for the base station.

Copyright Notice

Disclaimer

The information in this document is subject to change at any time without notice. For more information, please consult with a Baicells technical engineer or the support team.

Revision Record

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

Contact Us

	Baicells Technologies Co., Ltd.	Baicells Technologies North America, Inc.
	China	North America
Address	9-10F, 1st Bldg., No.81BeiqingRoad, Haidian District, Beijing, China	555 Republic Dr., #200, Plano, TX 75074, USA
Phone	400-108-0167	+1-888-502-5585
Email	contact@Baicells.com or support@Baicells.com	sales_na@Baicells.com or support_na@Baicells.com
Website	www.Baicells.com	https://na.Baicells.com

Contents

Figures

Tables

1. Product Overview

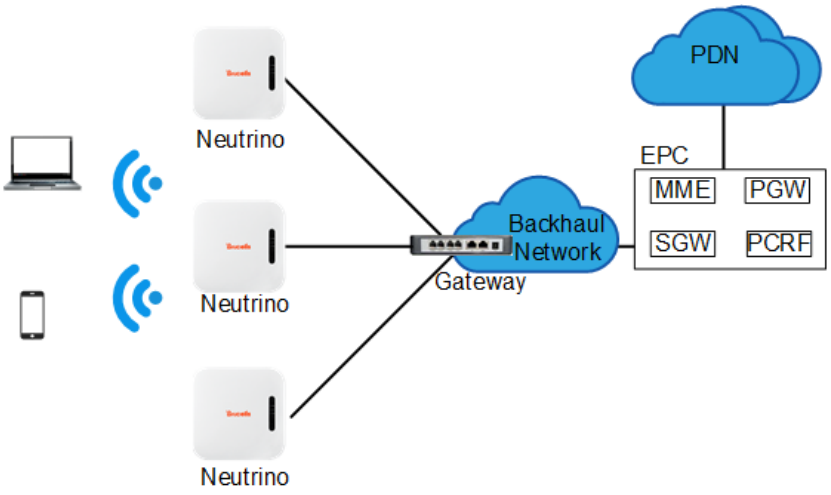
1.1 Introduction

Baicells NeutrinoE224 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 make 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 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

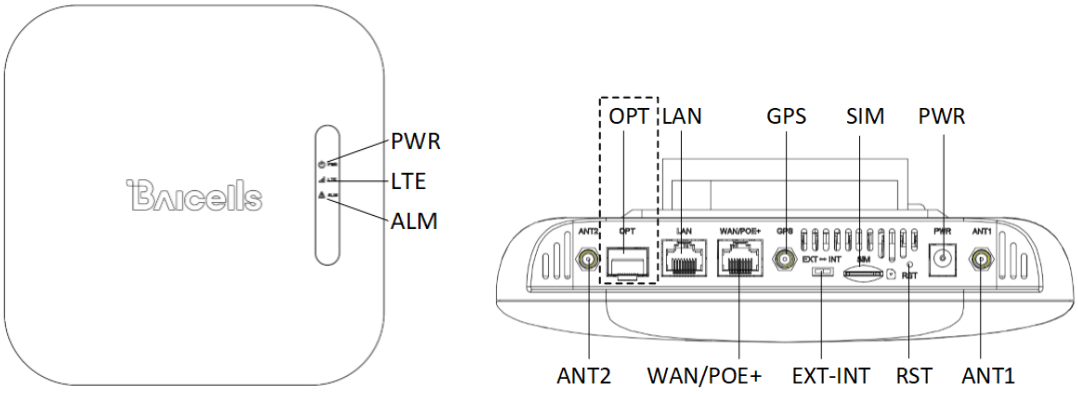
capacity rapidly.

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

Figure 1-2 NeutrinoE224 Appearance and Interfaces



The NeutrinoE224 interfaces are described in Table 1-1.

Table 1-1 NeutrinoE224 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

Interface	Description
	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 LED indicators are described in Table 1-2.

Table 1-2 NeutrinoE224 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 arounds 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 band.

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.IQ/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
Latency	30 milliseconds
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 • 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
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 base station can be installed on ceiling, wall or place on the desktop. If it is placed on the desktop, there need not any installation steps, connect the cables directly after placed it. The following separately introduces the tools, attentions and detailed installation steps when the NeutrinoE224 is installed on ceiling or on wall.

NOTE: Before installation, make sure the wiring has 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

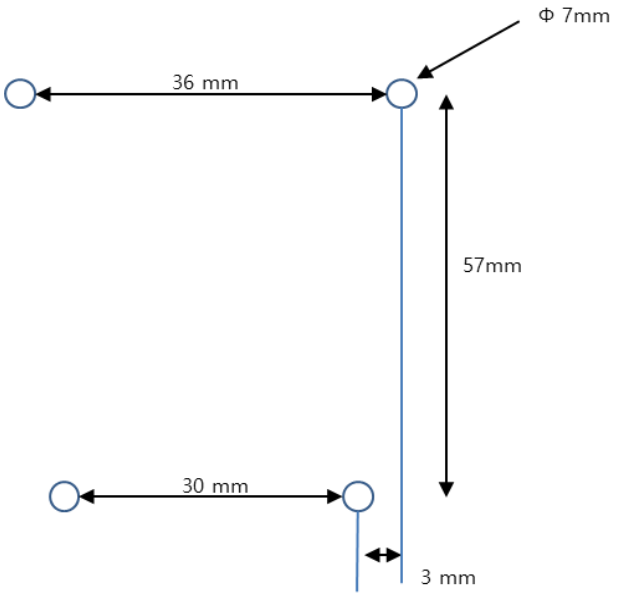
The NeutrinoE224 can be installed on ceiling.

Attention:

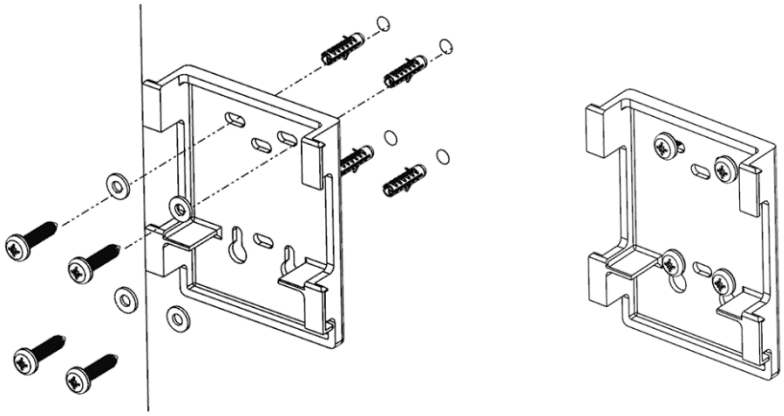
- The thickness of ceiling is not less than 18mm, and bearing weight is larger than 5kg. If the strength is not suitable, the device maybe fall off.
- If the ceiling is made of weak strength materials, such as gypsum ceiling, this installation method is not recommended. Because of the environment restriction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

Installation steps is as follows:

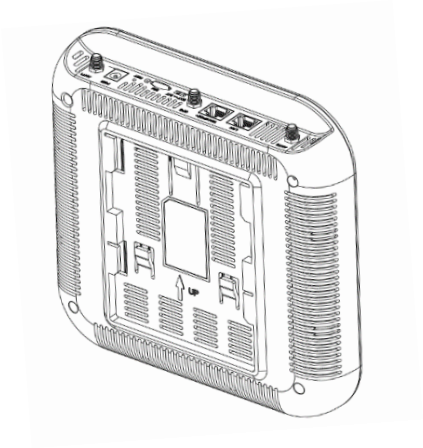
1. Take down a selected ceiling.
2. Place the bracket on center of the ceiling and mark the holes position with a marker pen.



3. According to the marked position, drill four holes.
4. Using expansion blot 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

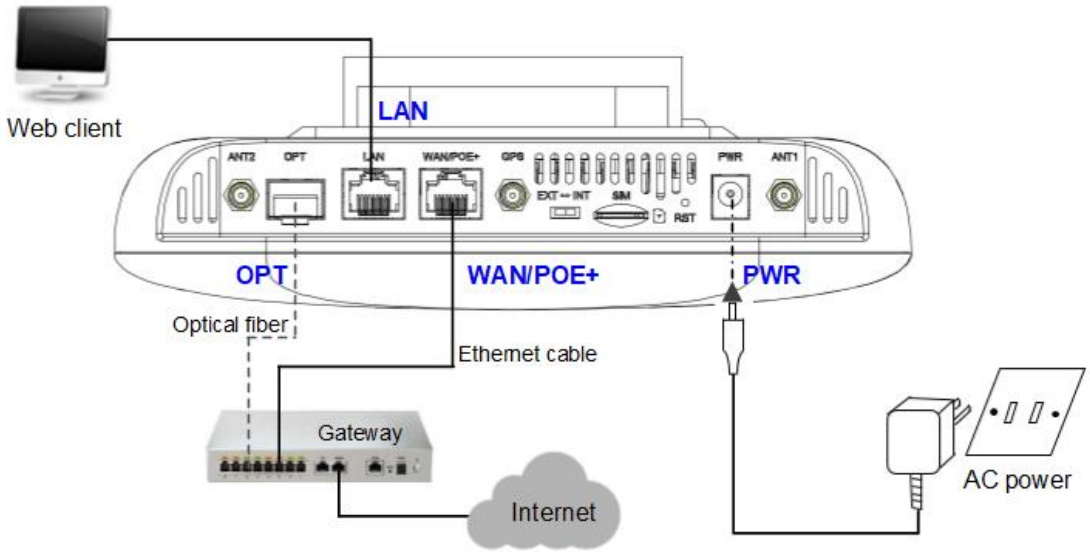
The NeutrionE224 can be installed on wall, the installation steps is the same as installation on ceiling.

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. Initial Configuration

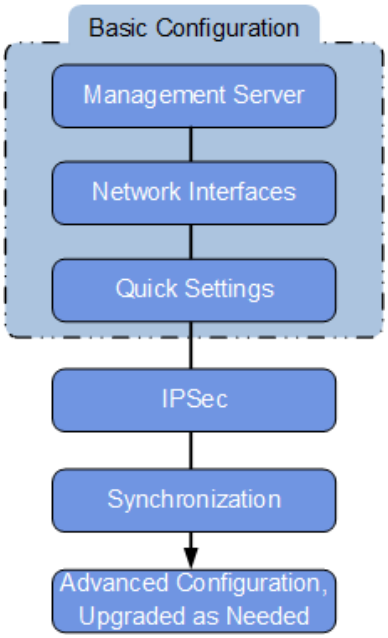
3.1 Configuration Overview

3.1.1 Configuration Procedure

The Baicells eNodeB (eNB) is loaded with its own GUI for configuring its operating parameters. You can log in to the GUI either locally through the Local Maintenance Terminal (LMT), which is an Ethernet port, or remotely via IP address. You can also use the Baicells Operations Management Console (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



3.1.2 Ethernet Interface Description

The Ethernet interfaces of the base station include LAN interface and WAN interface, for detailed information, refer to Table 1-1.

- LAN interface usually connects to local area network, that users used for logging in the base station to configure or maintain it.

- WAN interface usually connects to the network connecting to the operator's network, which used for data transmission between base station and operator's core network.

3.1.3 Data Planning

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

If you need to complete quick setting, please refer to "3.3 Quick Setting".

3.2 Login Web Client

3.2.1 Web Client Environmental Requirements

Table 3-1 describes the requirements on computer of the client.

Table 3-1 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 Windows10 or above • Mac: MacOSX10.5 or above
Screen resolution	Above 1024 x 768
Browser	Chrome 6 or higher

3.2.2 Connect Web Client to Base Station

Connect the Ethernet interface of the Web client computer to the LAN interface of the base station through the Ethernet cable.

3.2.3 Set Up Client Computer

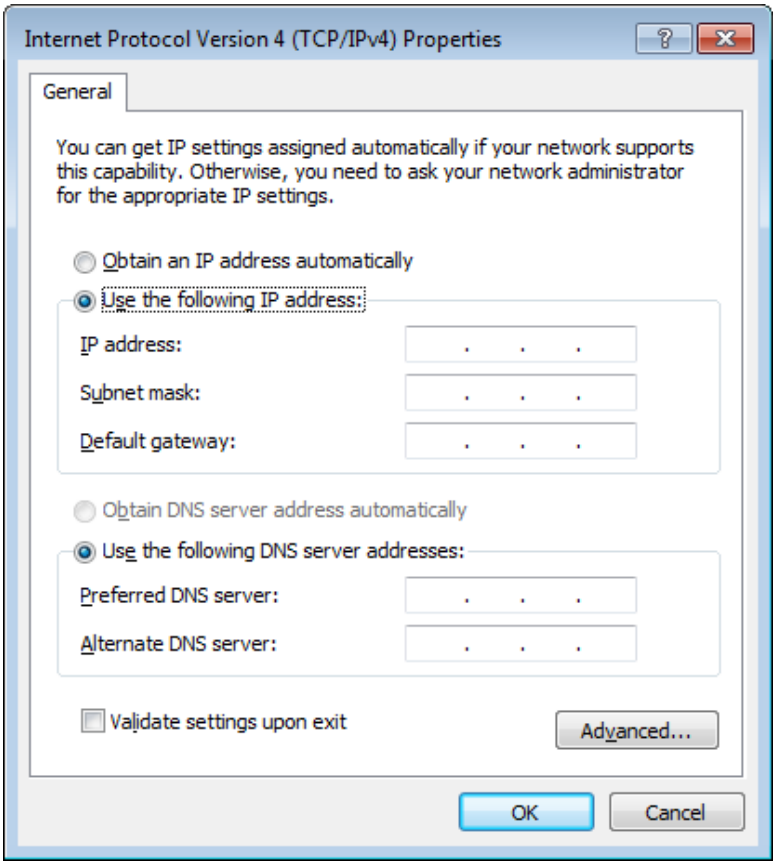
Before logging into the Web client, the client computer's IP address needs to be set up first so that the connection between the client and the server is possible. Take Windows10 as an example:

1. Click "**Start>Settings**" to enter into Windows Settings page.
2. In Windows Settings page, select "**Network and Internet**" to enter into

networking status and settings page.

3. On the left menu, select "**Ethernet**" to enter into Ethernet settings page.
4. In Ethernet settings page, select "**Network and Sharing Centre**" to pop up Network and Sharing Centre dialog box.
5. Click "**Ethernet**" to pop up "**Ethernet Status**" dialog box.
6. In "**Ethernet Status**", click "**Properties**" to pop up "**Properties of Ethernet**".
7. Select "**Internet Protocol Version (TCP/IPV4)**" and click "**Properties**" to pop up a window as shown in Figure 3-2.

Figure 3-2 Internet Protocol Version (TCP/IPV4)



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

- If "**Obtain an IP address automatically**" selected, go directly to step 10.
- If "**Use the following IP address**" selected, follow step 8 ~ step 10.

NOTE: The default of eNB parameter "LAN Internet Enabled" is disabled. Only when this parameter is set to Enabled, the web client can be set to "Obtain an IP address automatically". In general, set the IP address manually.

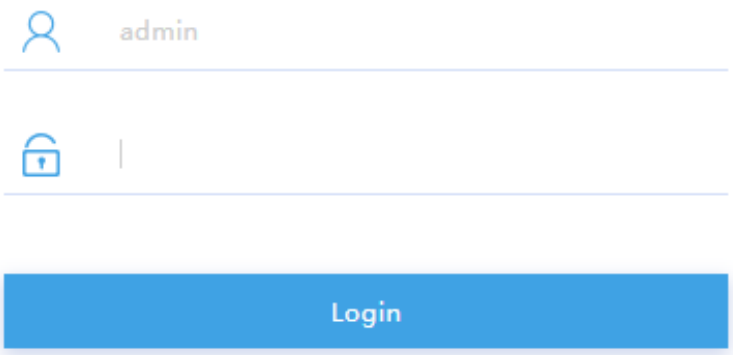
8. Select “**Use the following IP address**”.
9. Input IP address, subnet mask, and default gateway, and then click “**OK**”.
   - IP address: 192.168.150. XXX: (recommended XXX: 100~254)

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

3.2.4 Login

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

Figure 3-3 GUI Login

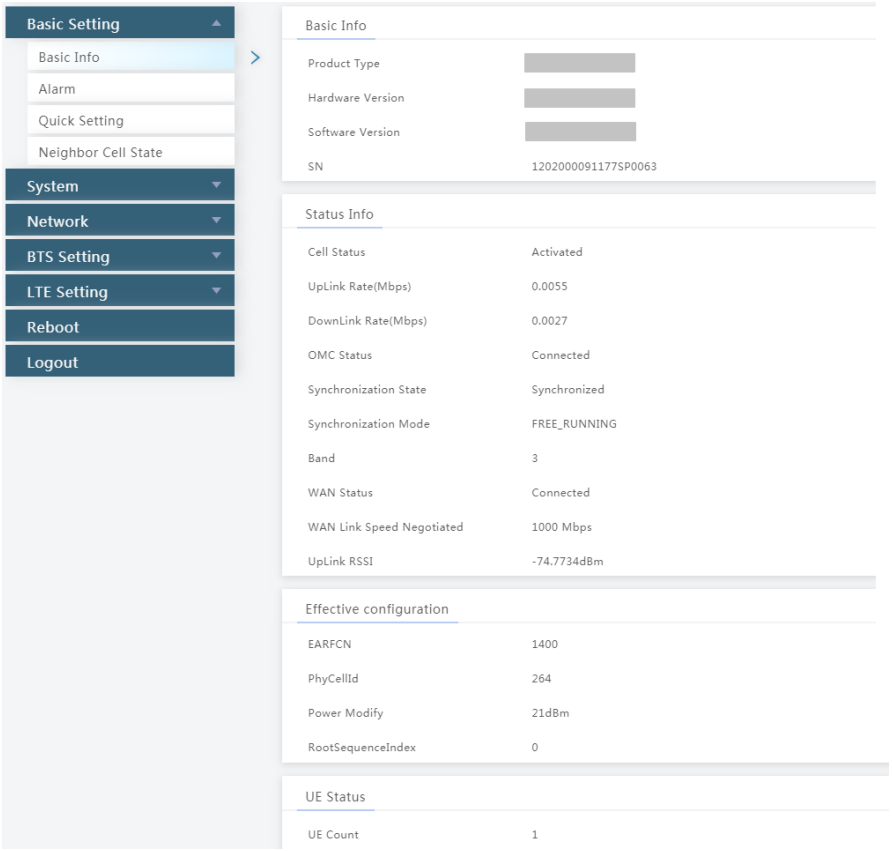


2. Input user name, password, and click “**Login**”. The homepage of the Web client is given in Figure 3-4.

   The default user name is *admin*, the default password is *eNB@xxxx. xxxx* is the last/tail 4 digits of the eNB serial number.

   For security seasons, you should change the password after you first log in rather than leaving the default admin. Refer “3.4.5 User Management” of this document.

Figure 3-4 GUI Homepage of the eNB's



NOTE: The basic information of the eNB here is indicative. If there is inconsistency between the screen shot and the actual product. The actual product shall govern.

On the upper right of the window, the language can be switch between English and Chinese.

On the left is the function menu of the eNB, including Basic Setting, System Setting, Network Setting, BTS Setting, LTE Setting, Reboot and Logout.

The homepage displays the navigation pane on the left, and shows the window for the first menu: **Basic Setting > Basic Info**. This window is like a dashboard for the eNB. The top of the window shows basic information such as the product type, hardware and software version, serial number.

The Status Info section reports whether the cell is currently active or inactive, if the eNB has a connection to the MME in the core, RF status, OMC connectivity, uplink and downlink rate, synchronization information, and WAN status, etc.

The Effective configuration section reports the important configured parameters, the EARFCN, physical cell identity, Tx power and root sequence index.

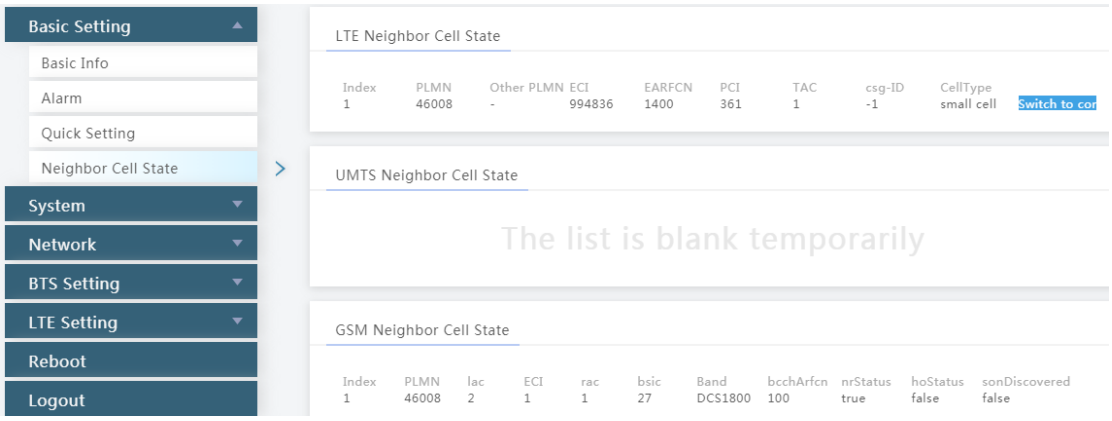
The settings for many of these fields are configured in other GUI menus. At the bottom, the window displays information about all user equipment (UE) attached to this eNB,

such as aggregate number of connections, average throughput, and error rate, etc.

"**Basic Setting > Alarm**" the menu displays the current alarms of the eNB.

"**Basic Setting > Neighbor Cell State**" the menu displays the current information of LTE, UMTS, GSM neighbors, as shown in Figure 3-5.

Figure 3-5 Neighbor Cell State



3.2.5 Logout

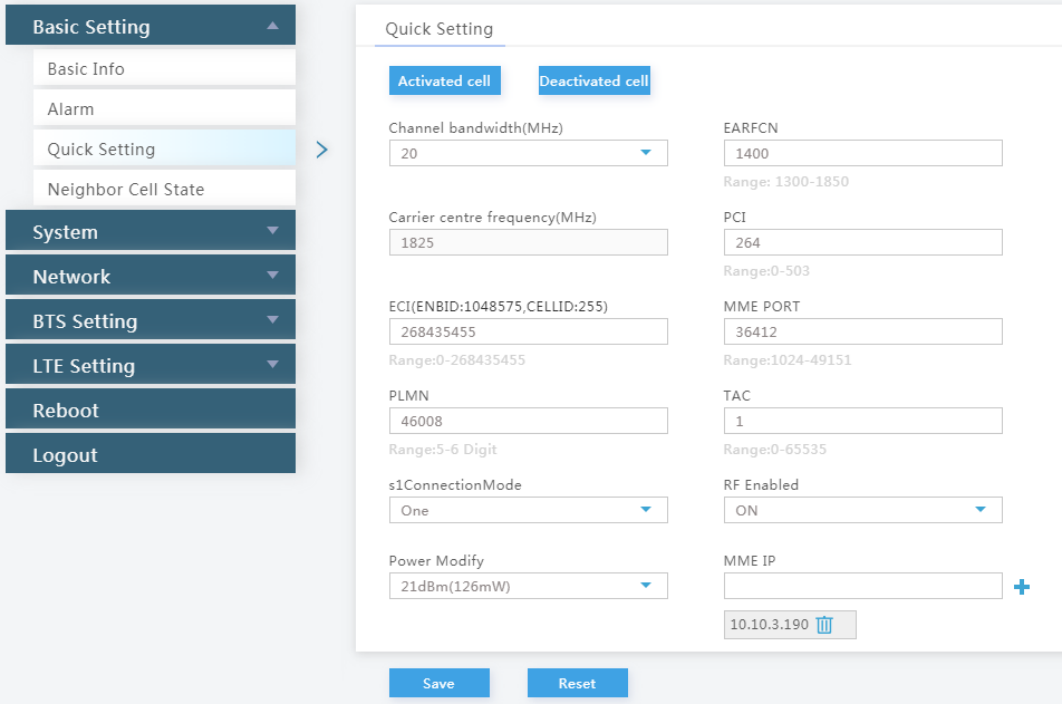
In the navigation column in the left, select "**Logout**" to log out the GUI.

3.3 Quick Setting

The quick settings configure the base station's primary parameters which involves in frequency, EARFCN, PCI, cell ID, etc. These parameters are often planned in advance in the network planning stage as part of the operator's overall network design.

1. In the navigation column in the left, select "**Basic Setting > Quick Setting**" to enter the quick setting page, as shown in Figure 3-6.

Figure 3-6 Quick Setting



NOTE: Here take the GUI of FDD eNB as an example, the parameters of TDD eNB is different from the FDD eNB. The actual product shall govern.

The parameter descriptions of the quick setting are given in Table 3-2.

Table 3-2 Quick Setting Parameter Description

Mode	Parameter	Description
TDD/FDD	Channel bandwidth (MHz)	Select the uplink and downlink bandwidth. • 5MHz • 10MHz • 15MHz • 20MHz
	EARFCN	The absolute radio frequency channel number, assigned by the operator in network planning phase.
	Carrier centre frequency(MHz)	The eNB's operating frequency. The range depends on the bandwidth and EARFCN.
	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**: Baicells does not use and does not work with PCI 0.
	ECI	Unique identification number for the Cell ID. Range from 0 to 268435455. The value of macro eNB and micro eNB is different.

Mode	Parameter	Description
		For macro eNB, the Cell ID + the eNB ID x 256 comprises the E-UTRAN Cell Identity (ECI), which identifies a cell site in the network. For micro eNB, the Cell ID is equal to ECI.
	MME PORT	The MME port of the IP address.
	PLMN	The numerical identifier for the operator's Public Land Mobile Network (PLMN) for this cell. Must be a 5- or 6-digit number.
	TAC	Tracking Area Code of the cell site where the eNB resides. The TAC is used to determine the range of the paging information. Range from 1 to 65535.
	s1ConnectionMode	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. **NOTE**: This parameter will not appear in HaloB mode.
	RF Enabled	The eNB displays the RF status.
	Power Modify	The maximum output power on each port. Must be within regulatory guidelines for the region. This field may be used in situations where you need to reduce the output power, such as testing the eNB before installing it on a tower; restricting the eNB output to reduce interference with other eNBs in the same geographical area; or staying within Effective Isotropic Radiated Power (EIRP) rules.
	MME IP	IP address that connects to the core network side. If the eNB is connected to the MME directly, enter the IP address of the MME. If the eNB is connected to the MME through a Signaling Gateway (SGW), enter the IP address of the SGW. **NOTE**: This parameter will not appear in HaloB mode.
TDD	subFrameAssignment	Downlink (DL) and uplink (UL) subframe configuration. • 1 (DL:UL=2:2) transmission ratio • 2 (DL:UL=3:1) transmission ratio (default)
	specialSubframePatterns	Special subfame pattern

Mode	Parameter	Description
		This is a standard LTE setting that pertains to synchronization of downlink and uplink timing. The guard period between switching from DL to UL or UL to DL determines the maximum supportable cell size. The guard period has to be large enough to cover the propagation delay of DL interferers. Range is 5 or 7. Default is 7.

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

   After saving the setting, the base station is activated by default. Click “Activated cell/Deactivated cell” to deactivate the base station or reactivate it.

   NOTE: In case of incorrect parameters found before the submission, click “**Reset**” to restore the data before the modification.

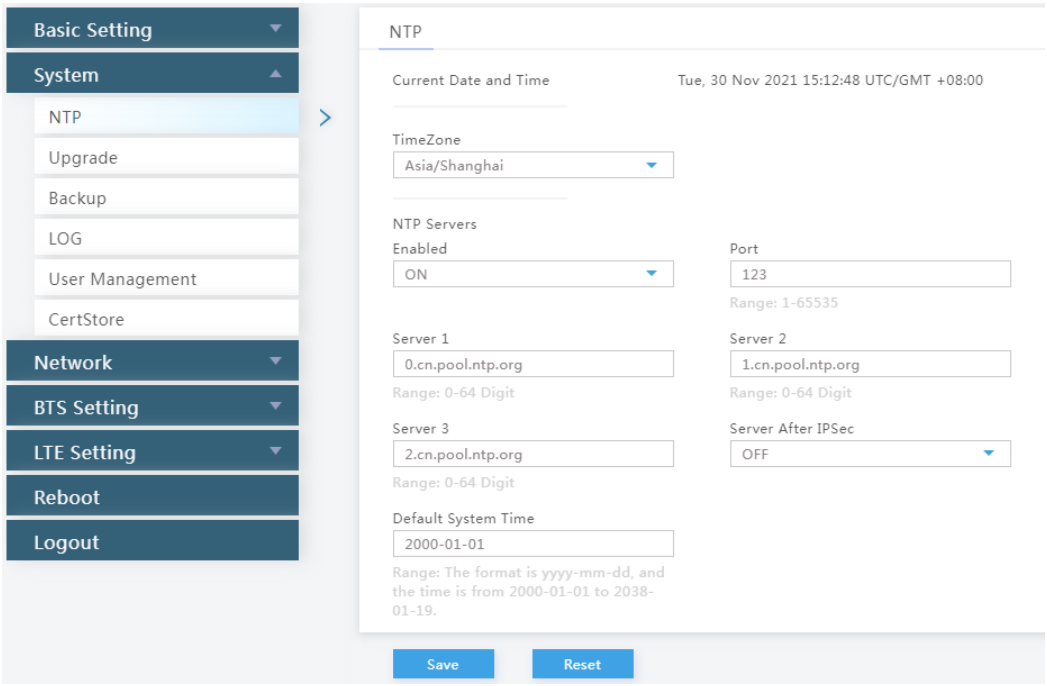
3.4 Configure System Parameter

3.4.1 Configure NTP

If the NTP is used by the eNB 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 3-7.

Figure 3-7 NTP Server Setting



2. The parameter description of the NTP server are given in Table 3-3.

Table 3-3 NTP Server Parameter Description

Class	Parameter	Description
Time Zone	TimeZone	Select the time zone that the base station located.
NTP Server	Enabled	Whether enable the NTP function.
	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.
	Server After IPsec	According to the actual deployed network, select whether the NTP server is after IPsec server. • **ON**: When certificating, the server will not wait for NTP synchronizing. • **OFF**: When certificating, the server will wait until the NTP has synchronized.
	Default System Time	Default time of the eNB.

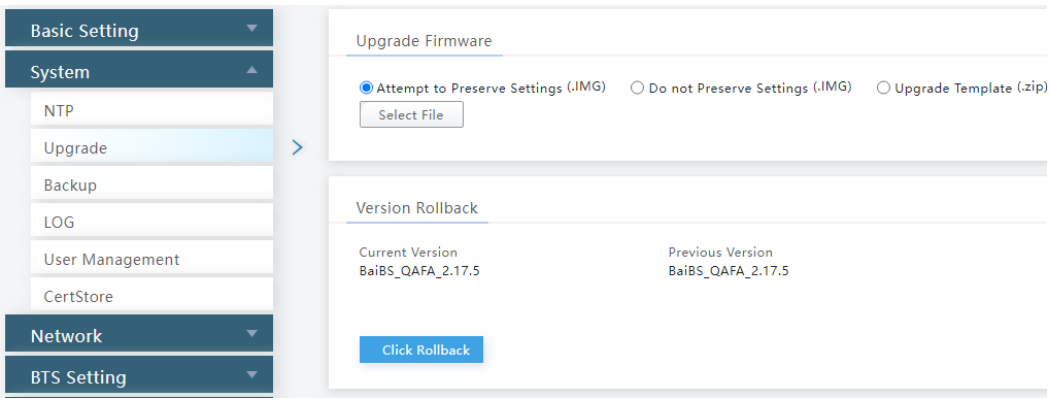
3. Click "**Save**" to complete the NTP server configuration.

3.4.2 Upgrade

When the preset version does not meet the actual need, the eNB will update the software. The system support firmware version upgrade and rollback.

In the navigation column on the left, select "**System > Upgrade**" as shown in Figure 3-8.

Figure 3-8 Software Upgrade



3.4.2.1 Firmware Upgrade

1. The operator gets the firmware file of new version and save it in local computer.
2. Select how to process the current settings.
   - Attempt to Preserve Settings (.IMG)
   - Do not Preserver Settings(.IMG)
   - Update Template (.zip)
3. Click "**Select File**" to select the firmware file.
4. Click "**Upload**" to upload the firmware file to the base station.
5. Check whether the software version is correct again and then click "**Update Now**".

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

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

3.4.2.2 Rollback

Only one rollback operation is allowed for each upgrade. Under the rollback permission of the base station, the software can roll back to the version before upgrade. After the rollback, a new rollback will not be permitted until an upgrade has taken place.

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

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

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

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

3.4.3 Backup

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

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

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

3.4.3.1 Import Configuration File

1. Click “**Select File**” to select the configuration file from the local computer.
2. Click “**Upload**” to import the configuration file.
3. Click “**Import the configuration file**” to import the file.

3.4.3.2 Import Default Configuration Files

1. Click “**Select File**” to select the configuration file from the local computer.
2. Click “**Upload**” to import the configuration file.
3. Click “**OK**” to import the file.

3.4.3.3 Update Factory Configuration Files

1. Click “**Select File**” to select the configuration file from the local computer.
2. Click “**Upload**” to import the default board configuration file.
3. Click “**Import the configuration file**” to import the file.

3.4.3.4 Backup Current Configuration

1. Click “**Get Backup Files**”.
2. In the pop-up download dialog box, select the file path to save the current configuration file to the local computer.

3.4.3.5 Backup Log Files

1. Click “**Get Log Files**”.
2. In the pop-up download dialog box, select the file path to save the log files to the local computer.

3.4.3.6 Backup Crash Logs

1. Click “**Get Crash Logs**”.
2. In the pop-up download dialog box, select the file path to save the crash log files to the local computer.

3.4.3.7 Restore Default Configuration

Attention:

After the restore operation, the base station will reboot immediately. Be careful to operate the "**Restore Default Configuration**" restore.

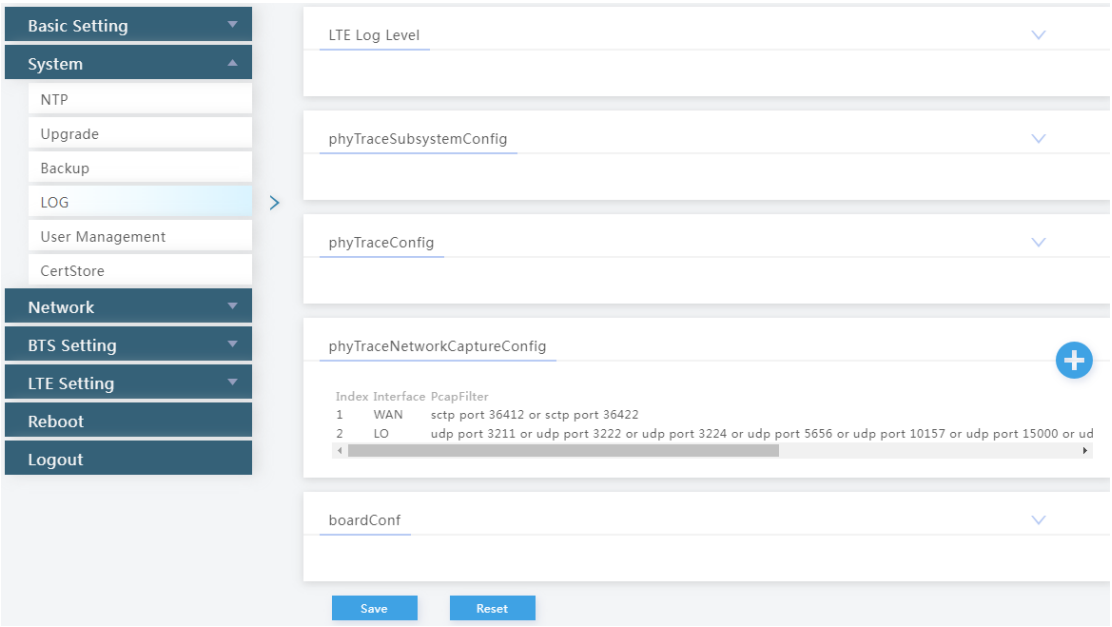
1. Click "**Restore Settings**".
2. In the pop-up download dialog box click "**OK**", the base station will reboot immediately.

   Wait for about three minutes, the base station will reboot completely.

3.4.4 LOG

On the left navigation column, select "**System> LOG**" to enter the log configuration page, as shown in Figure 3-9.

Figure 3-9 Log Configuration



3.4.4.1 LTE Log Level Setting

1. Click "**LTE log level**" to display the LTE log level configuration parameter, which descriptions are given in Table 3-4.

   Table 3-4 LTE Log Level Parameter Description

Parameter	Description
L2 log level	The print level of layer2 log.

Parameter	Description
RRC log level	The print level of RRC log.
oamAdapter log level	The print level of OAM adapter log.
RRM log level	The print level of RRM log.
SON log level	The print level of SON log.
OAM log level	The print level of OAM log.

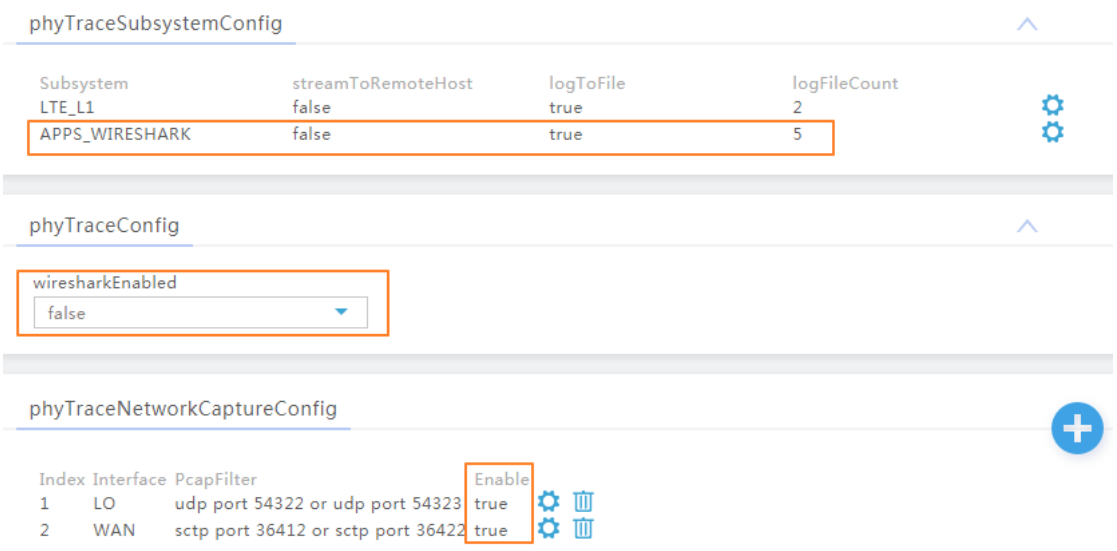
2. Click "**Save**" to complete the LTE log level setting.

3.4.4.2 phyTraceSubsystem/phyTrace Setting

The signaling trace is set by the eNB automatically. In general, it need not to be set.

1. Click "**phyTraceSubsystemConfig**" to display the trace list for subsystems, as shown in Figure 3-10.

Figure 3-10 phyTraceSubsystem/phyTrace Setting



2. Click ⚙ to modify the configuration of trace of subsystem, which descriptions are given in Table 3-5.

Table 3-5 phyTraceSubsystem Parameter Description

Parameter	Description
Subsystem	Select the subsystem.
streamToRemoteHost	Whether stream to the remote host.
logToFile	Whether save logs to file.
logFileCount	The count of the log file.

3. Click “**phyTraceConfig**” to select whether enable “wiresharkEnabled”.
4. Click  to display trace parameters, as shown in Table 3-6.

Table 3-6 phyTrace Parameter Description

Parameter	Description
Interface	The network card address for capturing.
PcapFilter	The filter rule for capturing.
Enable	Whether enable the function.

5. Click “**Save**” to complete the phyTraceSubsystem and phyTrace setting.

3.4.4.3 boardConf Setting

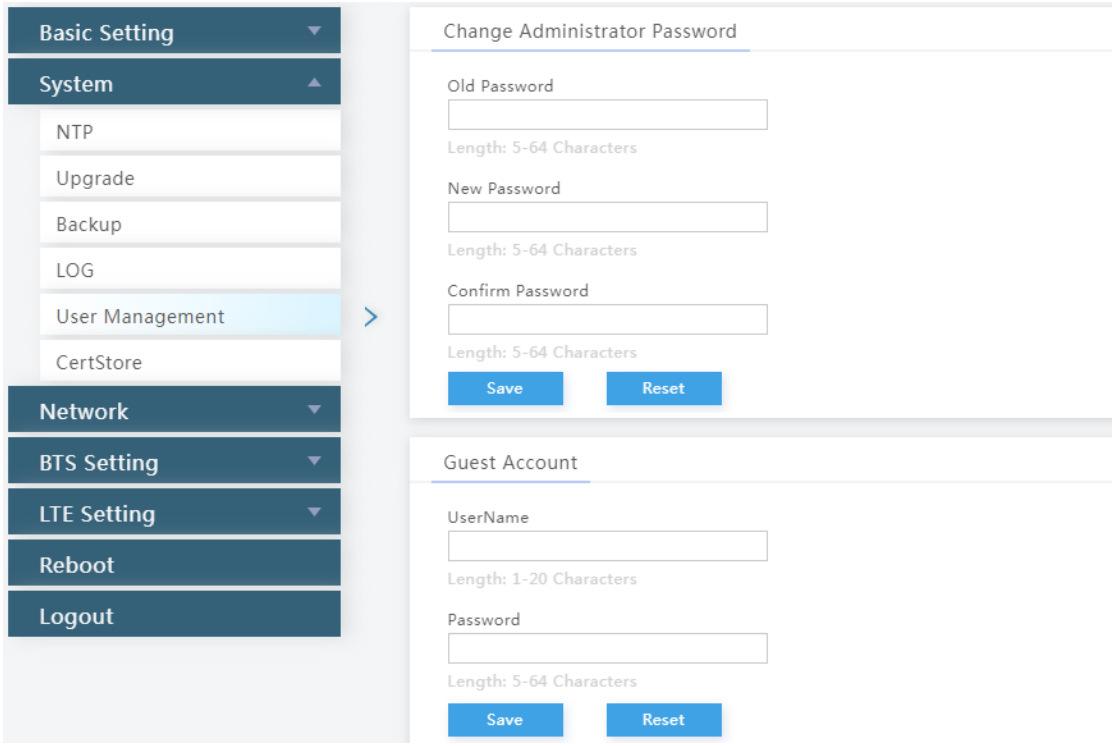
1. Click “**boardConf**” to enter board subsystem log level configuration page.
2. Set the log level of boardConf subsystem.
   - CRIT
   - ERROR
   - WARNING
   - NOTICE
   - INFO
   - DEBUG
   - DEVEL
3. Click “**Save**” to complete the board subsystem log level setting.

3.4.5 User Management

The eNB supports administrator login and guest login. This function is used to change the administrator’s password and set the guest account.

In the navigation column on the left, select “**System > User Management**” to enter the user management page, as shown in Figure 3-11

Figure 3-11 User Management



- Change Administrator Password

  Input the parameter “Old Password”, “New Password” and “Confirm Password”, and then click “**Save**” to complete the administrator password change.

- Guest Password

  Input the “UserName” and “Password” of guest account, and then click “**Save**” to complete the guest account setting.

3.4.6 Certificate

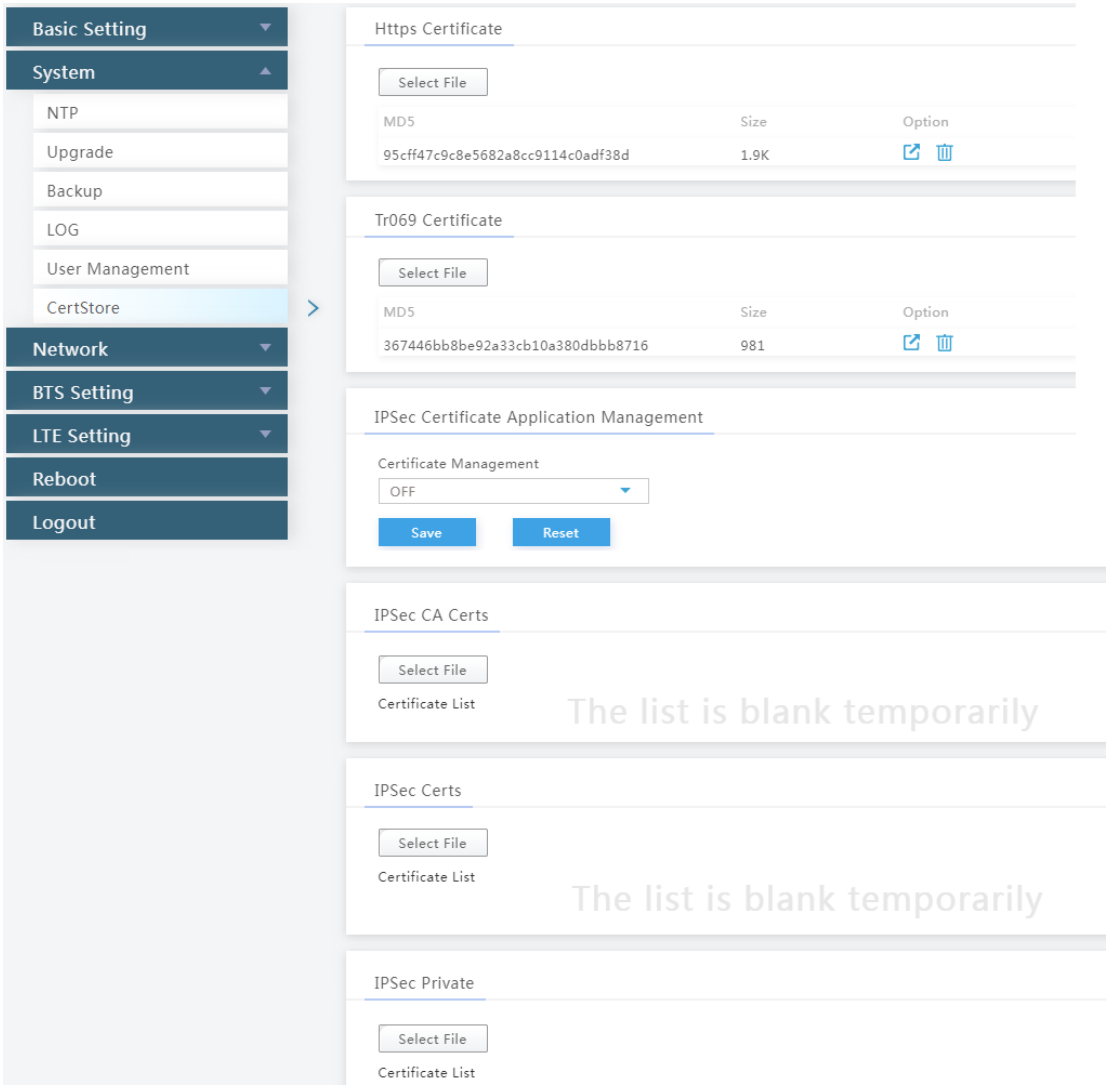
The certificate function support https certificate, TR069 certificate, IPsec CA certificate, IPsec certificate, etc.

Attention:

For IPsec private setting, only the **.der* files need to be operated. The **.bin* files are generated automatically and do not need to be operated.

In the navigation column on the left, select “**System > CertStore**” to enter the certificate page, as shown in Figure 3-12.

Figure 3-12 Certificate Management



Click "**Select File**" to select the certificate file from the local computer.

After the certificate file is upload to the eNB, you can view the certificate file in the certificate window. This file also can be download or delete from the base station.

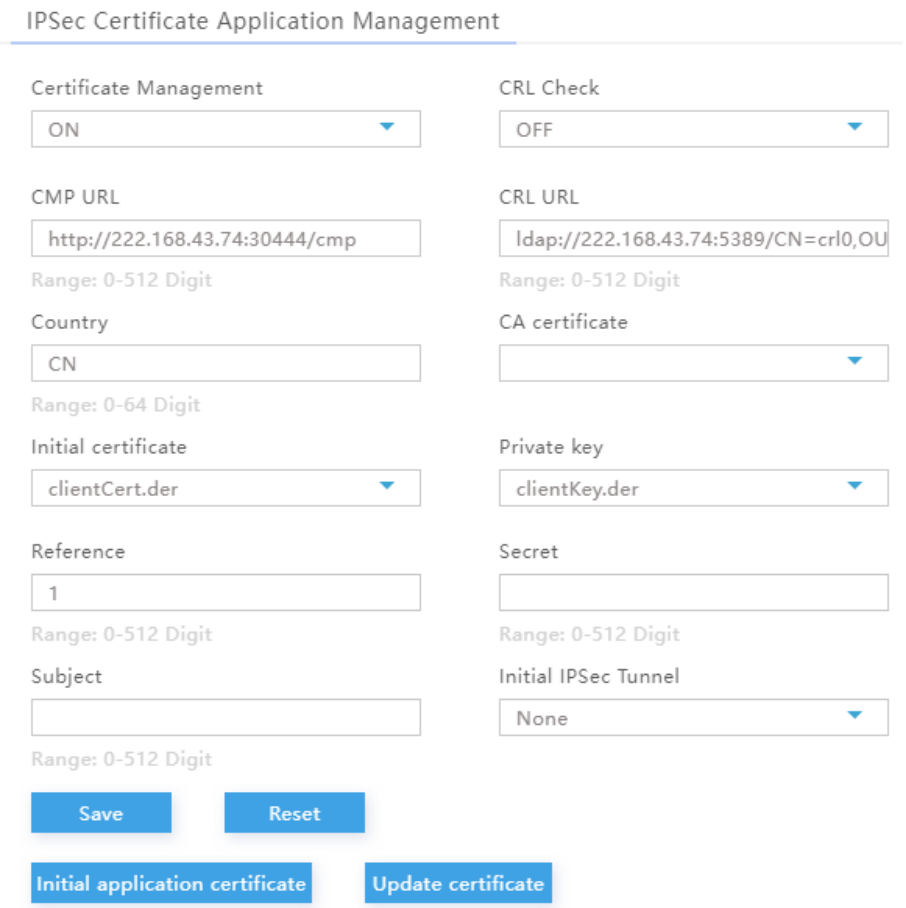
: export the certificate.

: delete the certificate.

NOTE: The following IPsec certificate application management applies only to the scenario where onsite certificate application is required.

If the operator uses a separate IPsec certificate server, IPsec Certificate Application Management should be enabled. The eNB will download and update certificates from the server automatically. The configuration parameters are shown in Figure 3-13.

Figure 3-13 IPsec Certificate Application Management



The IPsec certificate management parameters description are shown in Table 3-7.

Table 3-7 IPsec Certificate Management Parameters

Parameter	Description
Certificate Management	Set to ON to enable the certificate management function.
CRL Check	Whether check the Certificate Revocation List (CRL).
CMP URL	The URL of Certificate Management Protocol (CMP) server, which is used to get the digital certificate complied with X.509 standard.
CRL URL	The URL of CRL server, which is used to check revocation certificates.
Country	This parameter is configured based on the requirements of the server side.
CA certificate	Certificate authorization (CA) certificate.
Initial certificate	Select the initial certificate.
Private key	Select the private key.
Reference	This parameter is configured based on the requirements of the server side.

Parameter	Description
Secret	This parameter is configured based on the requirements of the server side.
Subject	This parameter is configured based on the requirements of the server side.
Initial IPsec Tunnel	Select the initial IPsec tunnel.

Click “**Save**” to complete the IPsec certificate management setting.

After completing above configuration, if it is the first time to apply the certificate, select “Initial application certificate”. If it is the certificate update, select “Update certificate”.

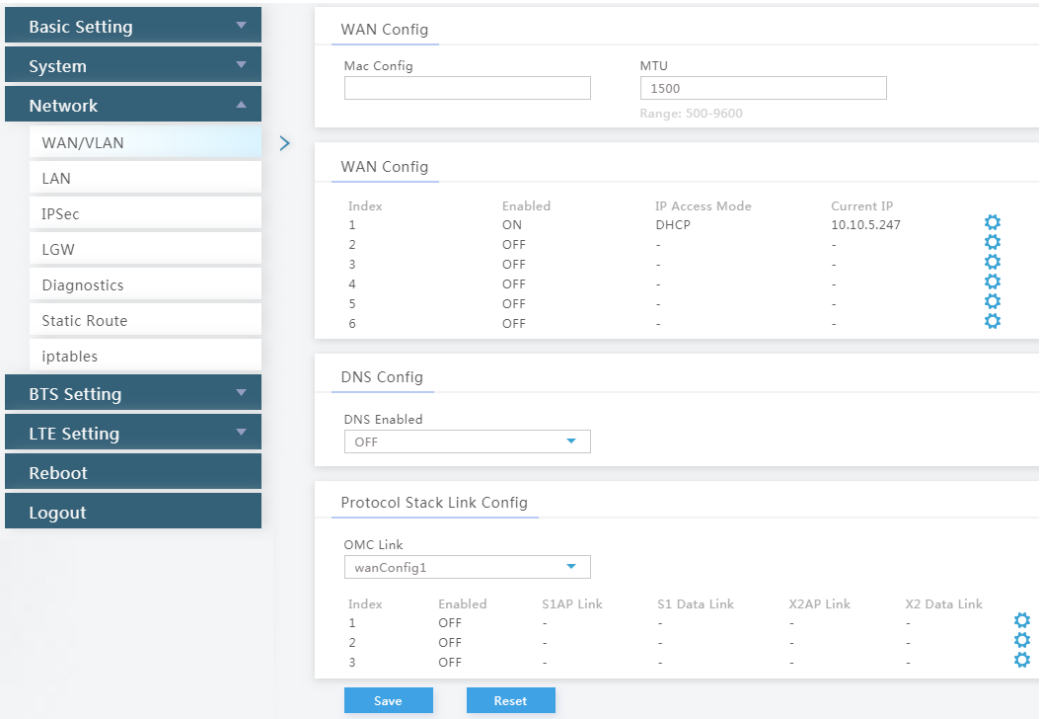
3.5 Configure Network Interface

3.5.1 Configure WAN/VLAN

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

1. Select “**Network > WAN/LAN**” to enter the WAN interface configuration page, as shown in Figure 3-14.

Figure 3-14 Configure WAN/VLAN



2. Configure the media access control (MAC) address and Maximum Transmission Unit (MTU).

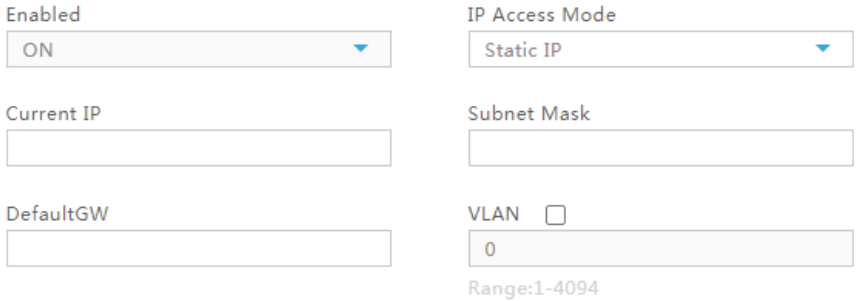
   Input the MAC address of WAN interface, and set the MTU according to the network (Default is 1,500 bytes).

   In general, the MAC address no need to be configured. Only when the 1588v2 synchronization is enabled, the MAC address need to be configured.

3. Configure the WAN interface to connect to external network. Up to 6 IP addresses are supported.

   a) Click ⚙ to display WAN interface configuration parameters, as shown in Figure 3-15.

   Figure 3-15 Configure to Connect to External Network



   b) Input configuration parameters for the WAN1 interface, the descriptions of the parameters are given in Table 3-8.

   Table 3-8 WAN Interface Parameter Description

Parameter	Description
Enabled	Whether enable the interface. The eNB supports to configure 6 IP addresses at most.
IP Access Mode	The interface protocol used by WAN interface, include: • **DHCP**: If DHCP is selected, only option 60 the parameter needs to be configured. • **Static IP**: the current IP address, netmask, and default gateway need to be configured. • **PPPoE**: the username and password need to be configured. • **IPV6 DHCP**: If IPV6 DHCP is selected, no parameter is needed to be configured. • **IPV6 Static IP**: the current IP address and prefix need to be configured • **IPV6 SLAAC**: If SLLAC is selected, no parameter is needed to be configured. **NOTE**: The DHCP and static IP is recommended.

Parameter	Description
option60	If set “**IP Access Mode**” to “**DHCP**”, display this parameter. Type in the value of option60. This parameter is used to identify the terminal type.
Current IP	If set “**IP Access Mode**” to “**Static IP**” or “**IPV6 Static IP**”, display this parameter. IP address of the WAN interface.
Subnet Mask	If set “**IP Access Mode**” to “**Static IP**”, display this parameter. Subnet mask address of the IP address.
DefaultGW	If set “**IP Access Mode**” to “**Static IP**”, enter the gateway address.
pppAuth	If set “**IP Access Mode**” to “**PPPoE**”, select the Authentication type. Options are chap or pap.
pppUser	If set “**IP Access Mode**” to “**PPPoE**”, enter the authenticated user name.
pppPassword	If set “**IP Access Mode**” to “**PPPoE**”, enter the authenticated PAP/CHAP password.
prefix	If set “**IP Access Mode**” to “**IPv6 Static IP**”, enter the prefix of IPv6 address.
VLAN	The VLAN interface’s ID, a unique number that must not be identical to any other VLAN. Range from 1 to 4094. Avoid entering “12”, which is commonly used by the LAN interface. 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.

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

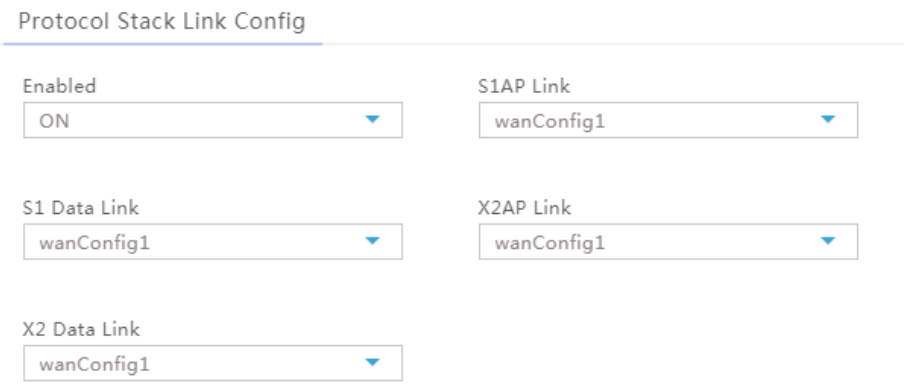
4. Select whether enable Domain Name Server (DNS).

5. Select the IP address that OMC link used, the default is “wanConfig1”.

6. If multiple IP addresses are configured, click to enable the protocol stack link configuration to establish the interface binding relationship.

   a) Enable the multi-link mode switch, as shown in Figure 3-16.

Figure 3-16 Configure Multi-link Mode



b) Input protocol stack link configuration parameters, as shown in Table 3-9.

Table 3-9 Protocol Stack Link Parameter Description

Parameter	Description
Enabled	Enable or disable the multi-link mode. When more than one IP address is needed, set the switch to “enabled”
S1AP link	Set the link used by s1ap, must be the enabled WAN interface or IPsec tunnel.
S1 Data link	Set the link used by s1 data plane, must be the enabled WAN interface or IPsec tunnel.
X2AP link	Set the link used by x2ap, must be the enabled WAN interface or IPsec tunnel.
X2 Data Link	Set the link used by x2 data plane, must be the enabled WAN interface or IPsec tunnel.

c) Click “**Save**” to complete the protocol stack link configuration.

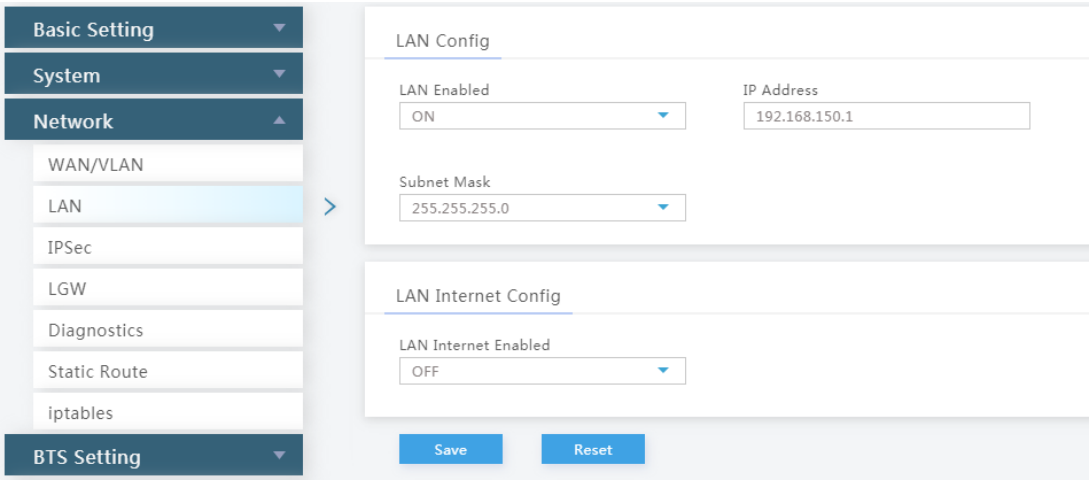
3.5.2 Configure LAN Interface

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

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

1. Select “**Network > LAN**” to enter the LAN interface configuration page, as shown in Figure 3-17.

Figure 3-17 Configure LAN Interface

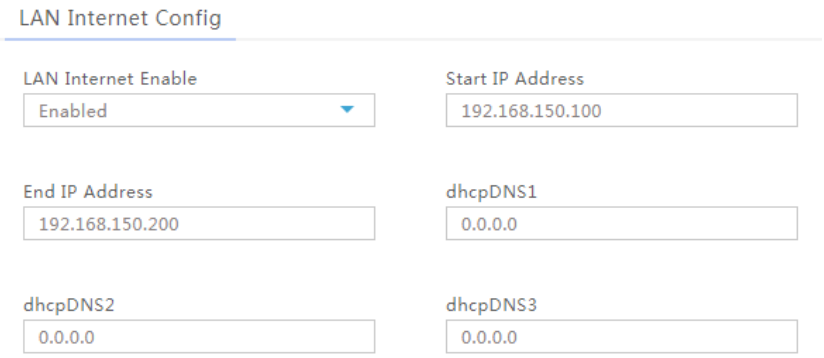


2. The LAN interface is enabled by default. If the "**IP address**" and "**Subnet mask**" need to be changed, input new values in the textbox.

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

3. If select enable the internet access function for LAN interface, enable the "**LAN Internet Enable**" function, as shown in Figure 3-18.

Figure 3-18 Enable LAN Internet Function



The parameter description of LAN internet function is shown in Table 3-10.

Table 3-10 LAN Internet Function Parameter Description

Parameter	Description
LAN Internet Enabled	Switch of internet function of LAN interface. Default is disabled.
Start IP Address	The start IP address of DHCP server.
End IP Address	The end IP address of DHCP server.
dhcpDNS1	DNS address 1 for DHCP server.
dhcpDNS2	DNS address 2 for DHCP server.
dhcpDNS3	DNS address 3 for DHCP server.

4. Click “**Save**” to complete the modification on the LAN interface.

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

3.5.3 Configure IPsec

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

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

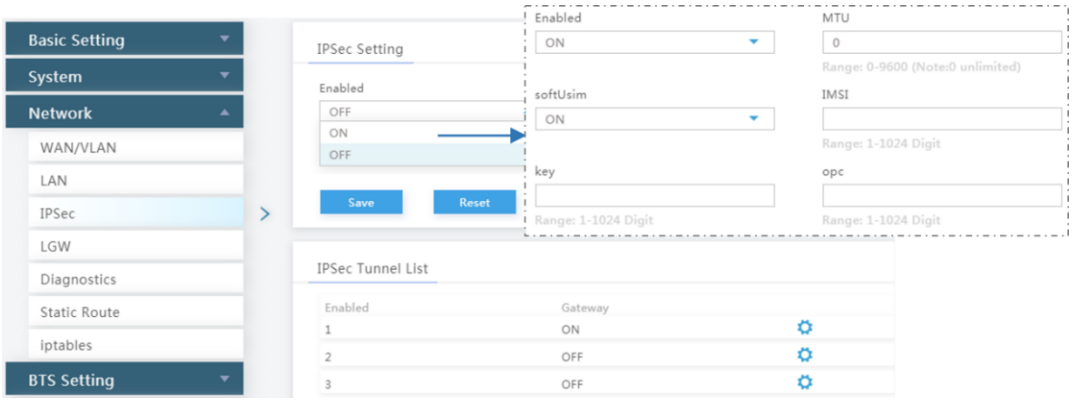
The eNB will enable the IPsec by default and up to three tunnels are supported.

ATTENTION: If “multi-link mode” does not be enabled (Refer to “3.5.1 Configure WAN/VLAN”.), only one IPsec tunnel can be supported and it must be **Tunnel 1**.

NOTE: After the IPsec function is enabled, the LGW mode in “3.5.4 Configure LGW” cannot be configured “**Bridge**”.

1. Select “**Network > IPsec**” to enter the IPsec configuration page, as shown in Figure 3-19.

Figure 3-19 Configure IPsec



2. Set the IPsec function, the parameter description is shown in Table 3-11.

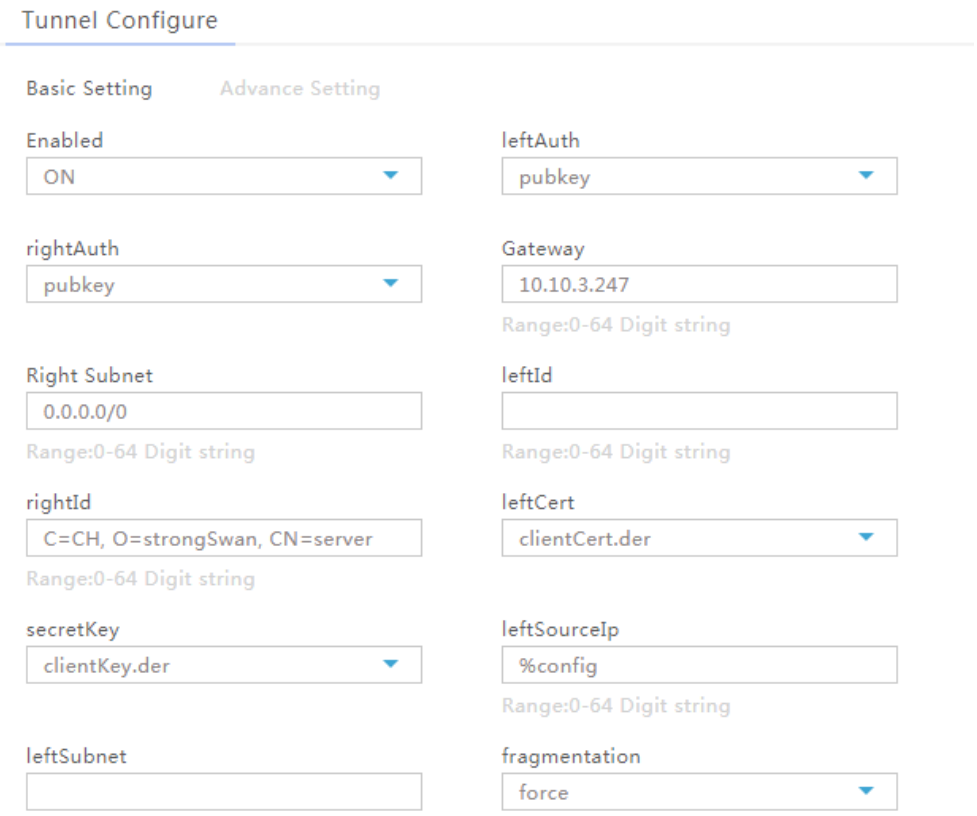
Table 3-11 IPsec Function Parameter Description

Parameter	Description
Enabled	Whether enable the IPsec function.
MTU	Set the maximum transmission unit.

Parameter	Description
softUsim	Select whether enable the soft USIM function. When the IPsec authentication is set to *eap-aka*, the parameter can be enabled. If disabled, the USIM authentication will not be adopted. Disabled by default.
IMSI	When “softUsim” is set to “ON”, the parameter displays. IMSI.
key	When “softUsim” is set to “ON”, the parameter displays. Key of the IMSI.
opc	When “softUsim” is set to “ON”, the parameter displays. The operator’s code.

3. Click “**Save**” to save the IPsec function setting.
4. Configure IPsec tunnel.
   a) In the “**IPsec Tunnel List**” area, click ⚙ to display the tunnel configuration page. First, configure the basic parameters, as shown in Figure 3-20.

Figure 3-20 IPsec Tunnel Setting- Basic Setting Tab



The description of basic parameters is shown in Table 3-12.

Table 3-12 IPsec Tunnel Mode- Basic Parameter Description

Parameter	Description
Enabled	Enable or disable the IPsec tunnel mode. The default value is enabled.
leftAuth	Local authentication type of the IPsec. Must be consistent with the security gateway side. • psk • pubkey • eap-aka
rightAuth	Peer 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 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.
leftId	Identification of the client end (0-48 digits string). It must be consistent with the security gateway side. If there is no security gateway left identifier, leave this field empty.
rightId	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.
leftCert	If set “**leftAuth**” to “**pubkey**”, the parameter need to be set. Certificate name of the client end. On this version is *clientCert.derpsk.*
secretKey	File name of private key. Default is clientKey.bin. When auth is *psk*, the value is the password of authentication.
leftSourceIp	Virtual address allocation. If absent, use the local IP address.
leftSubnet	IP address of the local subnet.
fragmentation	The type of fragmentation. • yes • accept • force • no

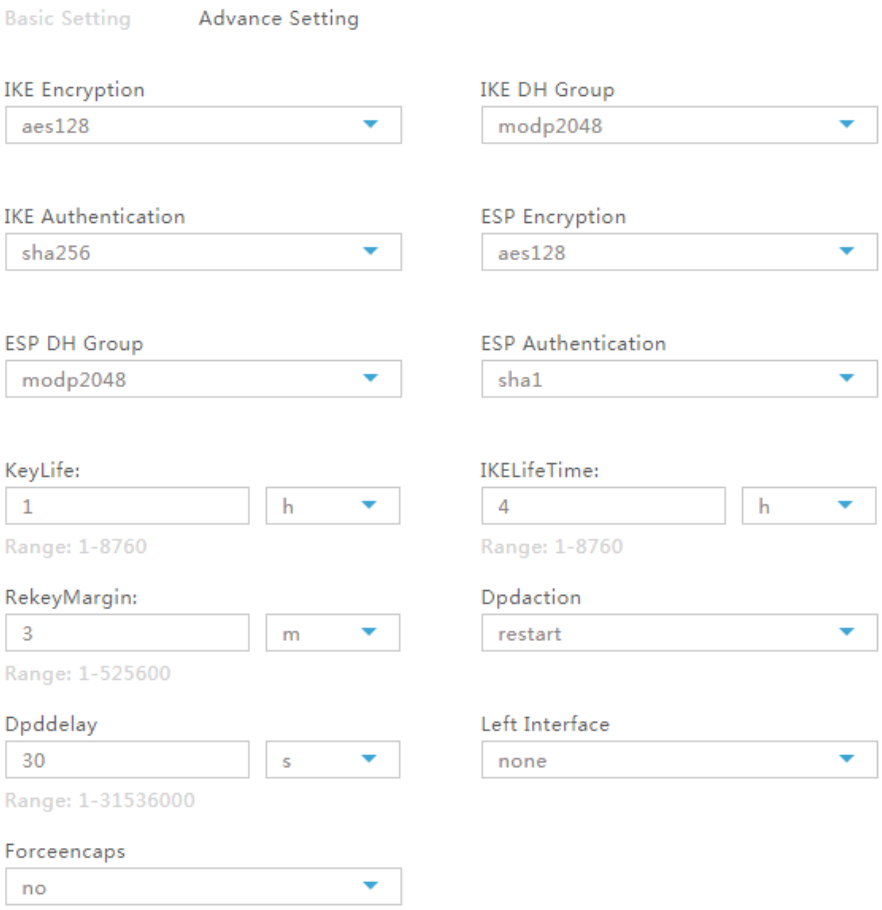
Caution:

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.

b) Click the "**Advanced Setting**" tag to enter the advanced setting page, as shown in Figure 3-21.

Figure 3-21 IPsec Tunnel Setting- Advanced Setting Tab



The description of advanced parameters is shown in Table 3-13.

Table 3-13 IPsec Tunnel Mode Advanced Parameter Description

Parameter	Description
IKE Encryption	Internet Key Exchange (IKE) encryption method. IKE is a protocol used to ensure security for virtual private network (VPN) negotiation and remote host or network access. • aes128

Parameter	Description
	• 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
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: Minutes, Hours or Days.
IKELifetime	IKE security association renegotiation time. Format: Minutes, Hours or Days.
RekeyMargin	Renegotiation time before the expiry of IkelifTime (negotiate the IKE security association time before the expiry of IkelifeTime). Format: Minutes, Hours or Days.

Parameter	Description
Dpdaction	DPD stands for dead peer detection (DPD) protocol. Determines what action to take when a gateway exception occurs. • none • clear • hold • restart
Dpddelay	Time interval for sending the DPD detection message. Format: Minutes, Hours or Days.
Left Interface	The interface in the eNB side, select from configured interface.
Forceencaps	Forced NAT switch

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

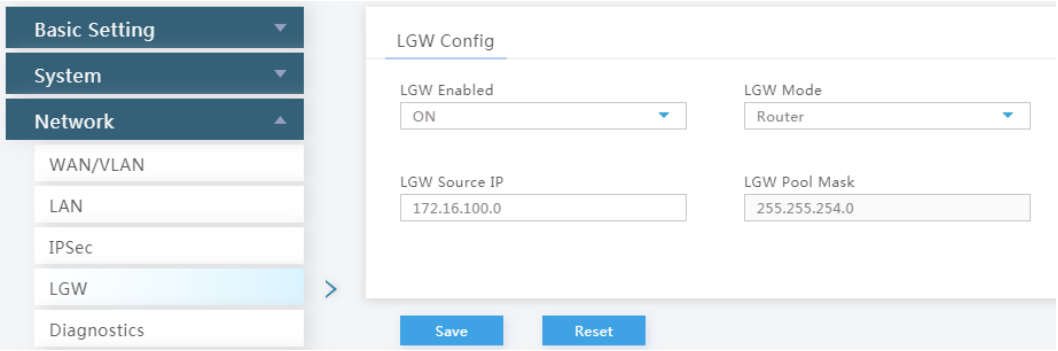
3.5.4 Configure LGW

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

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

1. Select “**Network > LGW**” to enter the LGW configuration page, as shown in Figure 3-22.

Figure 3-22 Configure LGW



2. Input the LGW configuration parameters, as shown in Table 3-14.

Table 3-14 LGW Parameter Description

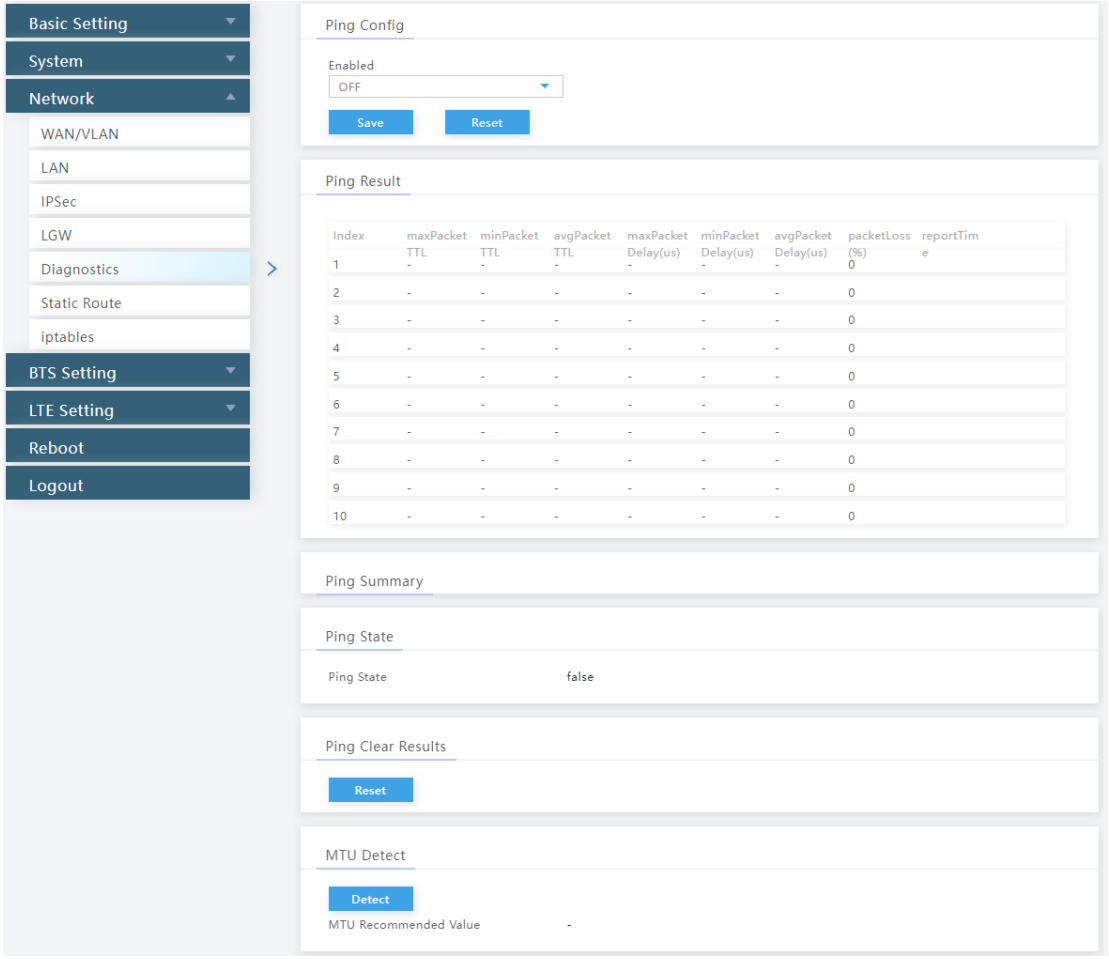
Parameter	Descriptions
LGW Enabled	LGW function switch. **NOTE**: In non-HaloB mode, if the LGW is enabled, you should enable the traffic offload function in “3.7.8 Configure RRC Status Parameter”.
LGW Mode	LGW mode. Select according to the actual situation of the operator’s network. • **NAT**: Packages from internal network to external network need NAT translation. • **Router**: select optimized route from the routing table. • **Bridge**: transfer in the data link layer. **NOTE**: When LGW Mode is set to “**Bridge**”, the IPsec function cannot be enabled. • **HaloB**: If the eNB operates in HaloB mode, select this value.
LGW Source IP	If “LGW Mode” select “Router”, this parameter displays. 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 Mask	If “LGW Mode” select “Router”, this parameter displays. For example, if the first IP address is 10.10.10.1, and the net mask is 255.255.254.0, the IP address pool includes 255 IP addresses.

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

3.5.5 Configure Diagnostics

Select “**Network > Diagnostics**” to enter the eNB diagnostics configuration page, as shown in Figure 3-23.

Figure 3-23 Configure Diagnostics



- Configure ping parameters

  Input the configuration parameters of ping function, which are given in Table 3-15.

Table 3-15 Ping Function Parameter Description

Parameter	Description
Enabled	Switch of ping.
pingDest	Peer IP address.
pingCount	Count per batch. Range: 1 to 65535.
pingInterval (s)	Interval of ping. Range: 1 to 600.
pingTimeout (s)	Overtime of ping. Range: 1 to 10.
pingDatalen	Length of ping package. Range: 0 to 65000.
pingBatchInterval (s)	Interval of every batch ping. Range: 1 to 65535.
pingBatchCount	Count of batch. Range: 0 to 65535.
packetlossAlarmThreshold (%)	Alarm threshold of packet loss. Range: 1 to 100.
packetdelayAlarmThreshold (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.

Click “**Reset**” to clear the results of ping operation.

- MTU Detect

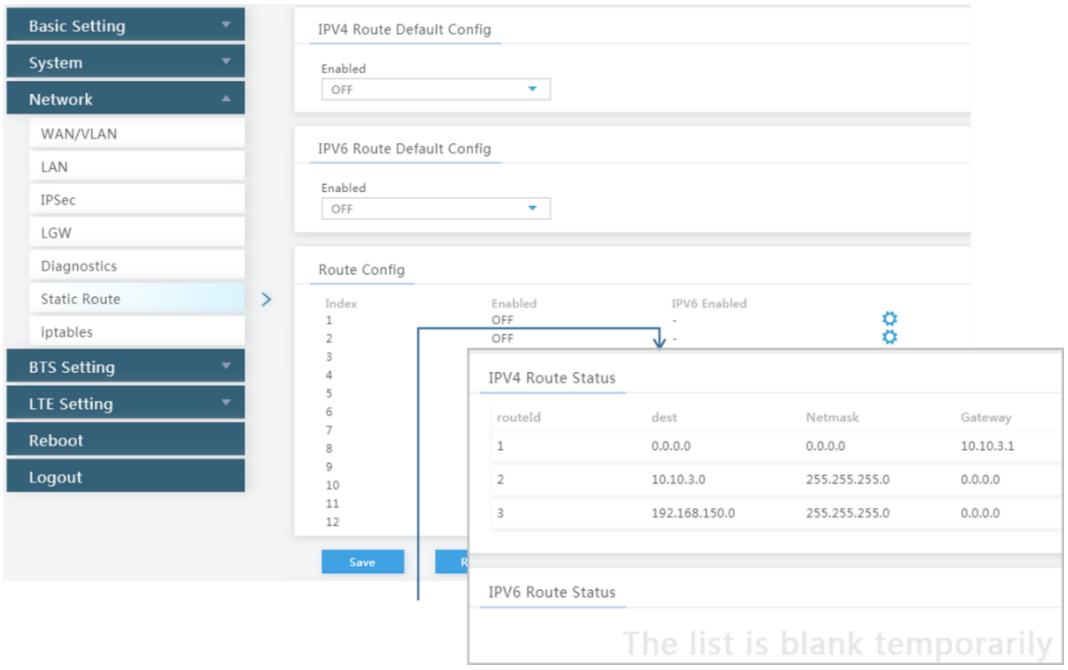
  Click “**Detect**”, the eNB will detect the quality of the current network environment and give a recommended value of MTU.

3.5.6 Configure Static Route

This function is for users configure the static route. The eNB supports IPV4 and IPV6 static route.

1. Select “**Network > Static Route**” to enter the static route configuration page, as shown in Figure 3-24.

Figure 3-24 Configure Static Route

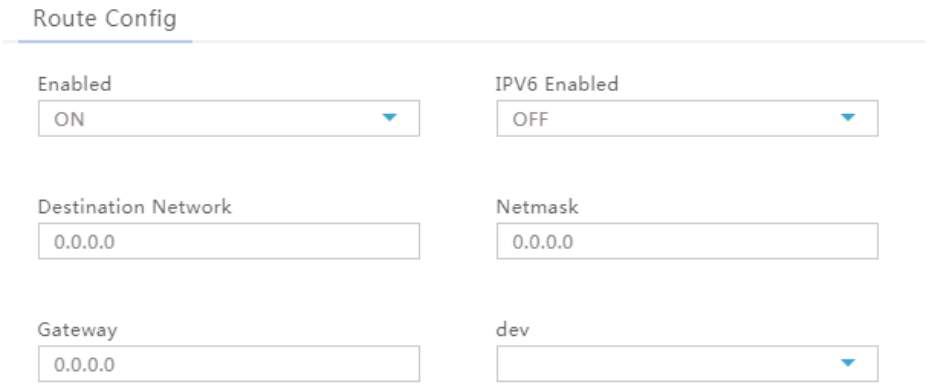


2. On the “IPV4/IPV6 Route Default Config” zone, select whether enabled the default gateway.

   If default gateway is enabled, the gateway configured for WAN1 will be covered.

3. Click ⚙ to display static configuration parameters, as shown in Figure 3-25.

Figure 3-25 Static Route Parameters



4. Input the configuration parameters of static route, which are given in Table 3-16.

Table 3-16 Static Route Parameter Description

Parameter	Description
Enabled	Whether enable the route. Default is disabled.
IPV6 Enabled	Whether enable IPV6 route.
Destination Network	The target IP address. **NOTE**: The target IP address must reachable from the original IP address of WAN interface or VLAN source port.
prefix	If “IPV6 Enabled” is set to “ON”, the parameter displays. The prefix of the IPV6 address.
Netmask	If “IPV6 Enabled” is set to “OFF”, the parameter displays. The subnet mask of target IP address.
Gateway	The gateway IP address of target IP address.
dev	Select the interface from the dropdown list.

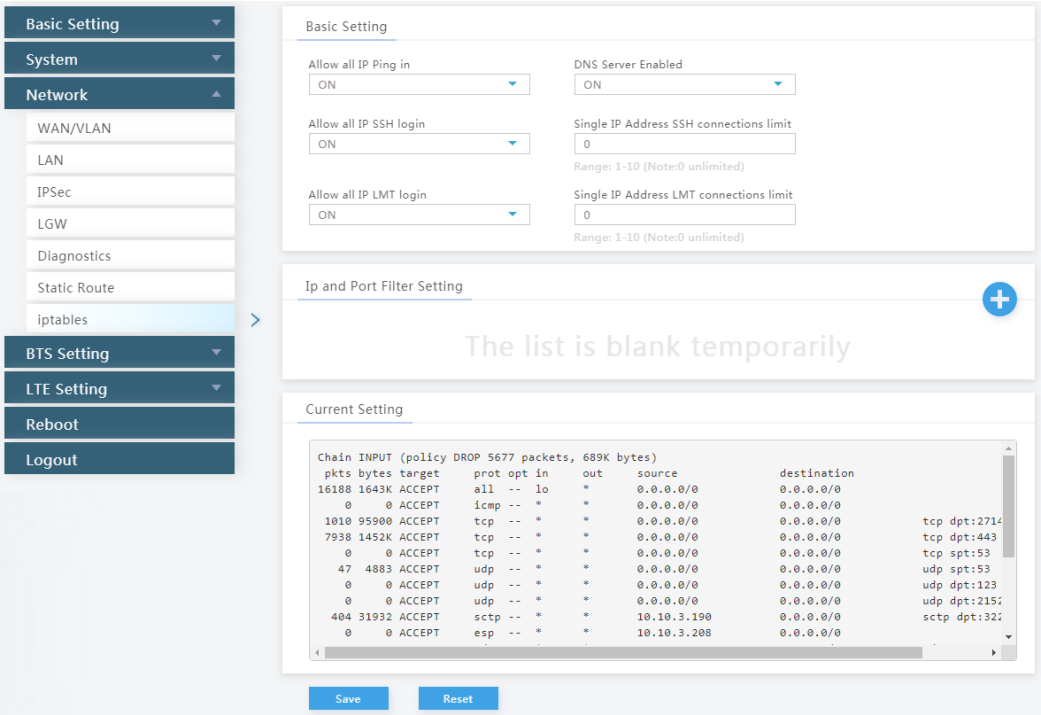
5. Click “**Save**” to complete the static route configuration.

   The system supports to configure up to 12 static routes, and at the bottom of the window, you can view the route table that configured.

3.5.7 Configure iptables

1. Select “**Network > iptables**” to enter the iptables page, as shown in Figure 3-26.

Figure 3-26 iptables Setting



2. Input iptables parameters, as shown in Table 3-17.

Table 3-17 iptables Parameter Description

Parameter	Description
Allow All IP ping in	Whether allow all IP addresses to run the ping operation.
DNS Server Enabled	Whether enable the DNS service.
Allow all IP SSH login	Whether allow all IP addresses to log in the eNB from SSH.
Single IP Address SSH connections limit	Quantity limitation of SSH connections for a single IP address.
Allow all IP LMT login	Whether allow all IP addresses to log in the eNB from LMT.
Single IP Address LMT connections limit	Quantity limitation of LMT connections for a single IP address.

3. Click  to display IP filter configuration parameters to set filter rule for dedicated IP addresses, as shown in Table 3-18.

Table 3-18 IP and Port Filter Parameter Description

Parameter	Description
Direction	The direction of data stream. INPUT or OUTPUT.
IP Address/Mask	IP address and mask.
Protocol	Protocol. • TCP

Parameter	Description
	• UDP • ICMP • SCTP • ALL
srcPort	The port of the source IP address.
dstPort	The port of the destination IP address.
Target	Target operation. • ACCEPT • DROP • REJECT

4. Click "**Save**" to complete the iptables configuration.

3.6 Configure eNodeB Parameter

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

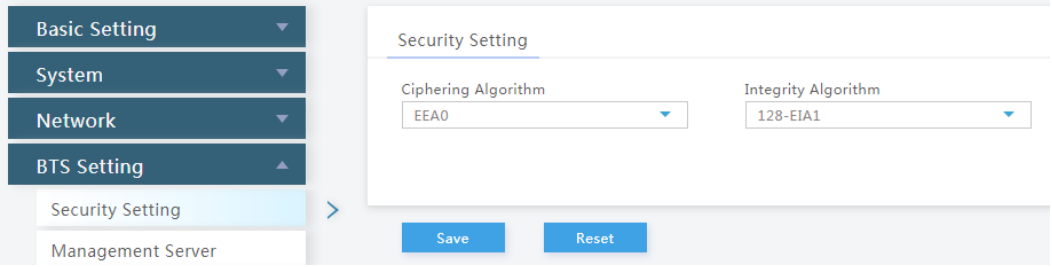
3.6.1 Configure Security

Caution:

Be careful to modify the value of the security parameters. In general, keep the default values.

1. On the left navigation column, select "**BTS Setting > Security Setting**" to enter the security setting page, as shown in Figure 3-27.

Figure 3-27 Security Setting



2. Input the security parameters, which descriptions are given in Table 3-19.

Table 3-19 Security Parameter Description

Parameter	Description
Ciphering Algorithm	Encryption algorithm

	• EEA0 (recommended) • 128-EEA1 • 128-EEA2 • 128-EEA3
Integrity Algorithm	Integrity protection algorithm • 128-EIA1 • 128-EIA2 • 128-EIA3

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

3.6.2 Configure Management Server

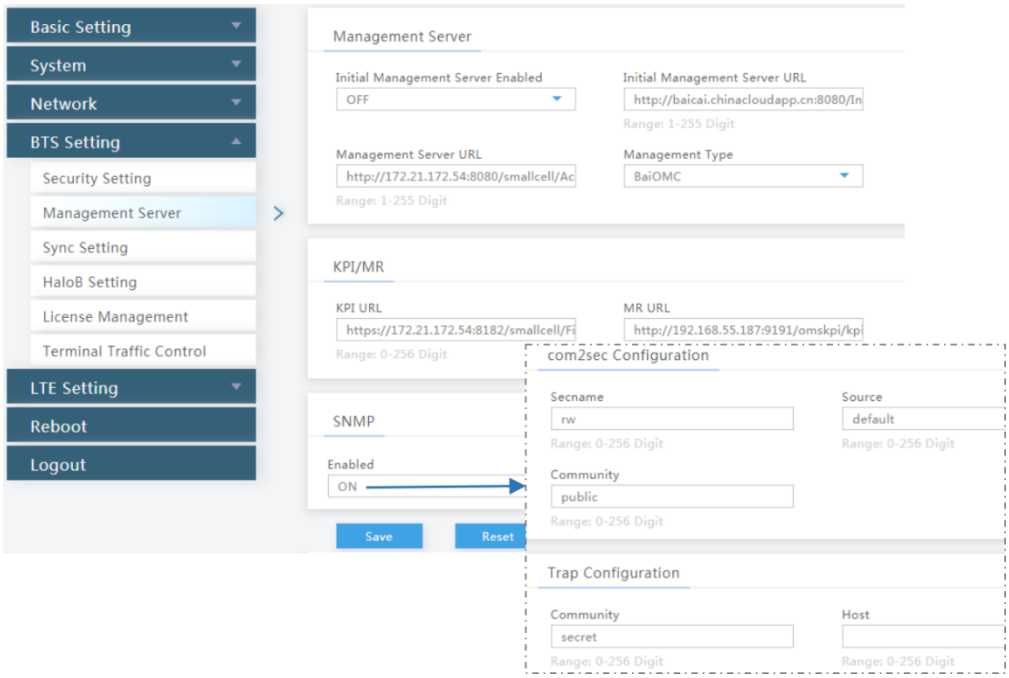
When a large amount of eNBs are deployed at one time, the Baicells provides initial server to implement the self-start, self-configuration for eNBs, The initial server is deployed in the network, eNBs are pre-configured the address of the initial server and enable the function. Once eNBs are powered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

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

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

1. In the left navigation column, select "**BTS Setting > Management Server**" as shown in Figure 3-28.

Figure 3-28 Configure Network Management Server



2. Input NMS configuration parameters, as shown in Table 3-20.

Table 3-20 NMS Configuration Parameter Description

Parameter	Description
Initial Management Server Enabled	Whether enable the initial management server. After this function is enabled, the eNB will connect to the initial management server when startup for the first time, the initial management server will assign NMS address for the eNB.
Initial Management Server URL	The address of the initial management server. The address is pre-configured, if enabled the function, the eNB will connect to the initial server automatically after powered on, the server will issue OMC address to the eNB.
Management Server	If Initial Management Server is enabled, the address is issued by the initial server. IP address and port number of the NMS. When the NMS is cloud NMS, the domain name is also supported.
Management Type	Select the type of the network management system. • Baicells • Chinamobile • JingXin

3. If the eNB manages by the third party NMS and reports KPI and MR information, the KPI and MR addresses should be configured. The parameter description is shown in Table 3-21.

Table 3-21 KPI and MR Report URL Parameter Description

Parameter	Description
KPI URL	The URL of KPIs reported.
MR URL	The URL of MRs reported.

4. If the eNB connects to the third party NMS by SNMP, enable the SNMP function and configure corresponding parameters, as shown in Table 3-22.

Table 3-22 SNMP Configuration Parameter Description

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

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

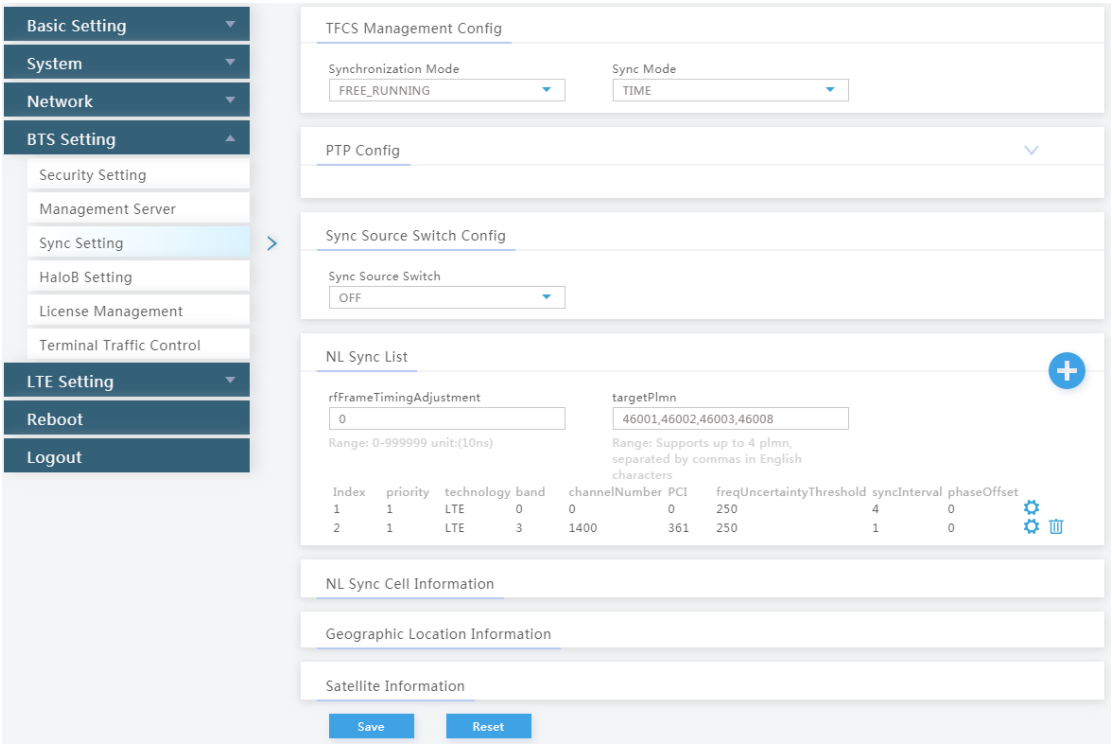
3.6.3 Configure Synchronization

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

The Baicells eNBs support the GPS, Network Listening (NL) and free running synchronization.

1. In the left navigation column, select “**BTS Setting > Sync Setting**” to enter the synchronization configuration page, as shown in Figure 3-29.

Figure 3-29 Synchronization Mode Setting



2. Set synchronization mode, the parameter description is shown in Table 3-23.

Table 3-23 Synchronization Parameter Description

Parameter	Description
Synchronization Mode	Select synchronization source. • PTP: Precision timing protocol, complied with IEEE1588 protocol. • GNSS: only GPS is supported. • NL: network listening • FREE_RUNNING **NOTE**: GPS synchronization can be configured only when the eNB is

Parameter	Description
	connected to a GPS antenna. Some eNB models do not support GPS antenna.
Sync Mode	Select synchronization mode. • FREQ • TIME

3. If Precision Time Protocol (PTP) synchronization mode is selected, set its parameters, as shown in Table 3-24.

Table 3-24 PTP Mode Parameter Description

Parameter	Description
Mode	The current mode is Mod1.
etherInterface	Select the interface PTP binding, the current version only support ***WAN1*** interface.
Mode Switch	Select unicast or multicast.
Domain	Domain, default is 0. Range from 0 to 255.
Sync Interval	Set interval of synchronizing message.
Delay Interval	Set the interval of delaying measurement.
Asymmetry	Set asymmetry time delay.
Startup Time	Set startup time of PTP, range from 0 to 5000.

4. Select whether enable the synchronization source switch.

   If the function is enable, the synchronization source can switch automatically.

5. If NL synchronization mode is selected, click  to add synchronizing cell, parameter description is as shown in Table 3-25.

Table 3-25 NL Synchronization Parameter Description

Parameter	Description
priority	The priority of this synchronizing source. The lower the value is, the higher the priority is.
technology	Network mode of the synchronization source. • LTE • UMTS • GSM
band	The frequency of the synchronizing band.
channelNumber	The frequency point of the synchronizing band.
PCI	The PCI of the synchronizing band. If the PCI does not be specified, the parameter is set to -1.
freqUncertaintyThreshold	The frequency threshold of the synchronizing band.
syncInterval	Interval of synchronizing measurement.

Parameter	Description
phaseOffset	Phase offset.

After air interface synchronization source is set, the page will display the synchronization source list.

6. Click "**Save**" to complete the synchronization setting.

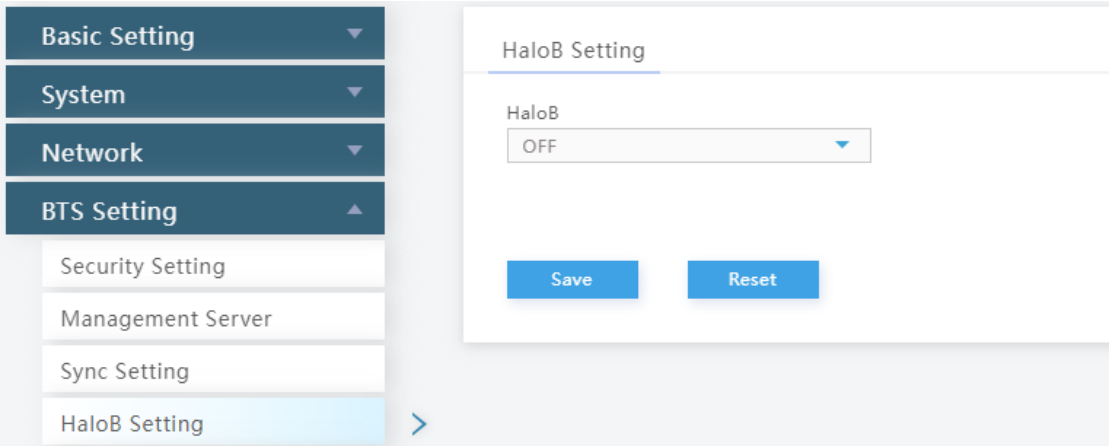
   According to the selected clock source, the corresponding synchronization information, such as NL synchronization cell information, geographic location information, or satellite information, is displayed at the bottom of the page.

3.6.4 Configure HaloB Function

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

1. In the left navigation column, select "**BTS Settings > HaloB Setting**" to enter the HaloB configuration page, as shown in Figure 3-30.

Figure 3-30 HaloB Setting



2. The HaloB function configuration parameters are shown in Table 3-26.

Table 3-26 HaloB Parameter Description

Parameter	Description
HaloB	Enable or disable the HaloB function. Only when the HaloB function is loaded, the function can be set to ON.
HaloB Mode	The HaloB function includes two kinds of mode. • Standalone mode In standalone mode, the client can maintain SIM Information locally. The administrator needs to import registration information and

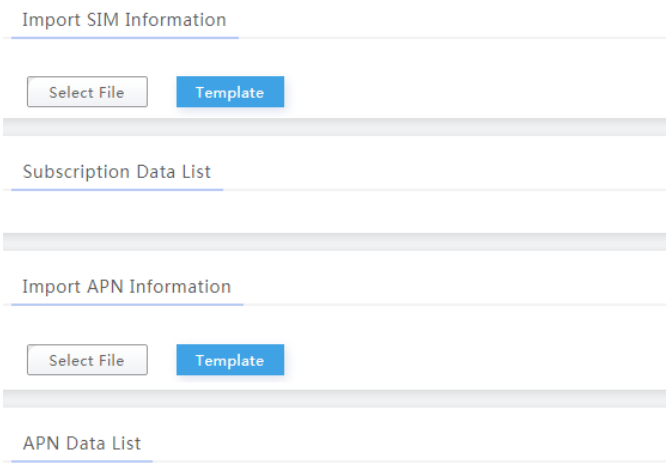
Parameter	Description
	APN information from the LMT. It is supported viewing cached user information and APN information on the LMT and delete the information. • Centralized mode In centralized mode, the eNB needs to connect to the OMC which do as an agent to manage the subscription data. The APN information needs to be set on the OMC and the APN for user access needs to be specified on the BOSS. These information displays on this page. When a user accesses the system for the first time, he/she needs to perform access authentication with the BOSS. After authentication, the eNB with HaloB stores the signing information of the user. When users access the system again, they do not need to perform access authentication to the BOSS, but directly perform authentication at the eNB with HaloB.
ONOS IP	(Reserved) This parameter is reserved for ONOS in the core network if VoLTE is implied.
IMS IP	(Reserved) This parameter is reserved for IMS in the core network if VoLTE is implied.

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

NOTE: Only the setting is saved and the eNB is rebooted, the function will take effort.

4. If HaloB Mode is set to "Standalone mode", the SIM information and APN information must be imported, as shown in Figure 3-31

Figure 3-31 Import SIM Information and APN Information



You need to download the template and import the filled file with SIM card or APN information.

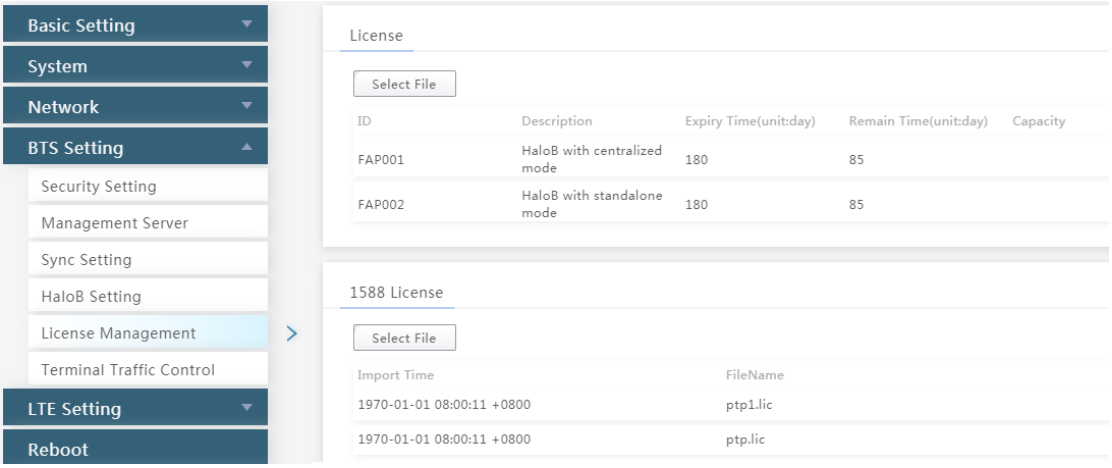
NOTE: If VxLAN function should be used, load the VxLAN license first.

3.6.5 License Management

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

1. In the left navigation column, select "**BTS Settings > License Management**" to enter the synchronization configuration page, as shown in Figure 3-32.

Figure 3-32 License Management



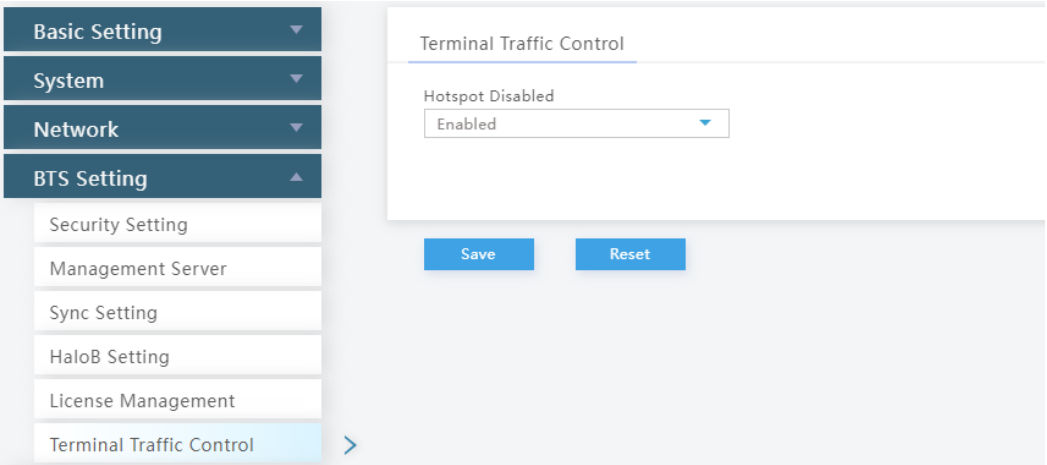
2. Click "Select File" to select License file from the local computer.
3. Click "**Import License**" to upload the license file to the eNB.

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

3.6.6 Configure Terminal Traffic Control

1. Select "**Network > Terminal Traffic Control**" to enter the terminal traffic control management page, as shown in Figure 3-33.

Figure 3-33 Terminal Traffic Control Setting



2. Choose whether enable the hot spot control function.
3. Click "**Save**" to complete the terminal traffic control configuration.

3.7 Configure LTE Parameter

Caution:

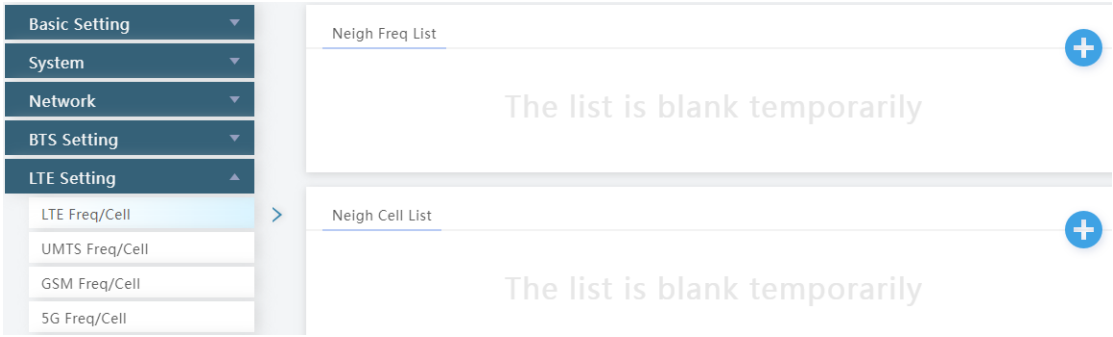
It is not recommended to modify the advanced LTE parameters for common operators. It is better to keep the default values. For senior experts in need, please treat it with great caution.

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.

3.7.1 Configure LTE Neighbor Frequency and Cell

1. Select "**LTE Setting > LTE Freq/Cell**" to enter the LTE neighbor frequency and cell configuration page, as shown in Figure 3-34.

Figure 3-34 LTE Neighbor Frequency/Cell Setting



Users can add, modify, and delete the LTE neighbor frequency and cell. Up to eight LTE neighbor frequencies and 32 LTE neighbor cells can be set.

LTE Neighbor Frequency

2. On the right of the neighbor frequency list, click ⊕ to enter the page for adding a LTE neighbor frequency. The parameter descriptions are given in Table 3-27.

Table 3-27 LTE Neighbor Frequency Parameter Description

Parameter	Description
EARFCN	The value is planned in the network planning phase by the operator. In short, this is the frequency point of the neighboring eNB's frequency. Range from 0 to 65,535. EARFCN stands for Envolved Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access (E-UTRA) Absolute Radio Frequency Channel Number.
meansBandwidthForEarfcn	Select measurement band width. • 1.4MHz • 3MHz • 5MHz • 10MHz • 15MHz • 20MHz
qOffsetFreq	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.

Parameter	Description
qRxLevMin	Minimum access level. When the receive signal power of UE is larger than this threshold, the UE can resident on the cell.
pMax(dBm)	The maximum transmit power that UEs in this cell are allowed to use in the uplink. Range is -30 to 33 dBm. A typical value is 23 dBm.
tReselectionEutra	Determines when the cell reselection time expires. Range is 0 to 7 seconds. A typical value is 0 second.
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. 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.
Reselection Priority	Priority of the cell reselection to cells at this frequency. Range is 0 to 7 (integer). A typical value is 4.
HeNB PCI Start	PCI start value of the home eNB
HeNB PCI Range	PCI range of the home eNB

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

LTE Neighbor Cell

4. On the right of the neighbor cell list, click  to enter the page for adding a LTE neighbor cell, the parameter descriptions are given in Table 3-28.

Table 3-28 LTE Neighbor Cell Parameter Description

Parameter	Description
PLMN	The 5-6 digit PLMN that the neighbor cell belongs to.
ECI	Unique identification number for the Cell ID. Range from 0 to 268435455. The value of macro eNB and micro eNB is different.

Parameter	Description
	For macro eNB, the Cell ID + the eNB ID x 256 comprises the E-UTRAN Cell Identity (ECI), which identifies a cell site in the network. For micro eNB, the Cell ID is equal to ECI.
EARFCN	Frequency point of the neighbor cell.
phyCellId	Physical Cell Identifier (PCI) of the neighbor cell.
qOffset	Frequency offset this neighbor cell. Indicates the difference in signal level between the serving and this neighboring eNB, as determined by the received signal level at the UE. If the received signal level is better from a neighboring eNB by at least this amount of difference in dB, the UE will reselect this cell. Range is +24 to -24. A typical value is 0dB.
cio	Cell Individual Offset (CIO) is this neighbor eNB's cell offset, which is one of the variables used to determine which eNB will best serve a given UE. Range is 0 to -24. A typical value is 0dB.
TAC	Tracking Area Code (TAC) of this neighbor cell.
accessMode	Access mode of the cell. • ClosedAccess • HybridAccess • OpenAccess(Macro) • OpenAccess(HeNB)

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

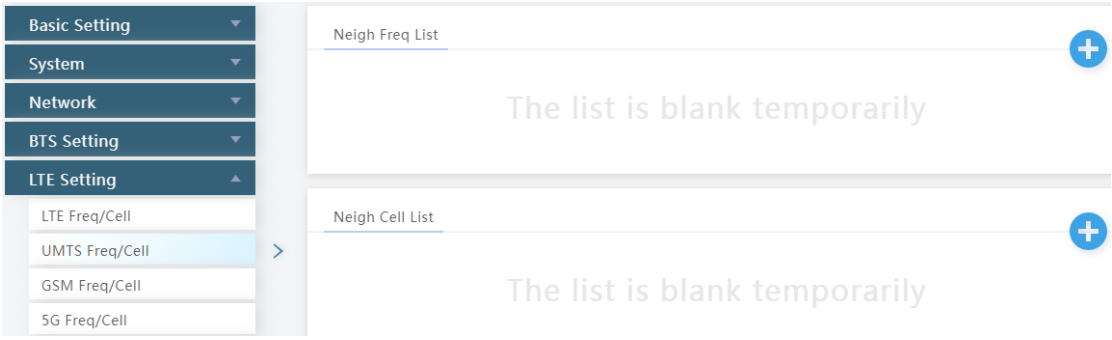
3.7.2 Configure UMTS Neighbor Frequency and Cell

NOTE: If HaloB function is enabled, this menu does not display.

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

1. Select "**LTE > UMTS Freq/Cell**" to enter the UMTS neighbor frequency and cell configuration page, as shown in Figure 3-35.

Figure 3-35 UMTS Neighbor Frequency/Cell Setting



Users can add, modify, and delete the UMTS neighbor frequency and cell. Up to 12 UMTS neighbor frequencies and 32 UMTS neighbor cells can be set.

UMTS Neighbor Frequency

2. On the right of the neighbor frequency list, click ⊕ to enter the page for adding a UMTS neighbor frequency. The parameter descriptions are given in Table 3-29.

Table 3-29 UMTS Neighbor Frequency Parameter Description

Parameter	Description
UARFCN	Frequency point of the neighboring eNB's frequency.
qRxLevMin (dBm)	The minimum received signal level at which a UE will detect a neighboring eNB's signal. Range is -60 to -13 dBm. Only the received signal power measured by the UE is higher than this threshold, the UE can camp on this cell.
qQualMin	The threshold for lowest access. Range: -24 to 0.
Reselection Priority	Priority of the reselection to cells at this 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	The cell reselection threshold for a lower priority inter-band frequency. Represents the access threshold level at which the UE will leave the serving cell and reselect another cell at the target frequency (assuming the target frequency cell has an absolute priority than the serving cell). Range is 0 to 31dB.
pMaxUtra	Maximum transmit power a UE allowed to use in the uplink, for limiting the transmit power of the UE within this cell

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

UMTS Neighbor Cell

4. On the right of the neighbor cell list, click ⊕ to enter the page for adding a UMTS neighbor cell. The parameter descriptions shown are given in Table 3-30.

Table 3-30 UMTS Neighbor Cell Parameter Description

Parameter	Description
PLMN	The PLMN that the neighbor cell belongs to
rncId	The neighbor cell’s Radio Network Controller (RNC).
Cell ID	Identify of a cell, allocated by the operator. ECI = eNB ID*256+cell ID e.g. ECI = 256055, eNB ID=1000,cell ID=55.
lac	Location area code (LAC) of the neighbor cell.
uarfcnDl	UARFAN for download.
uarfcnUl	UARFAN for upload.
pCpichScramblingCode	Scrambling code for main CPICH.
psHoSupported	This neighbor whether support PS domain switchover.

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

3.7.3 Configure GSM Neighbor Frequency and Cell

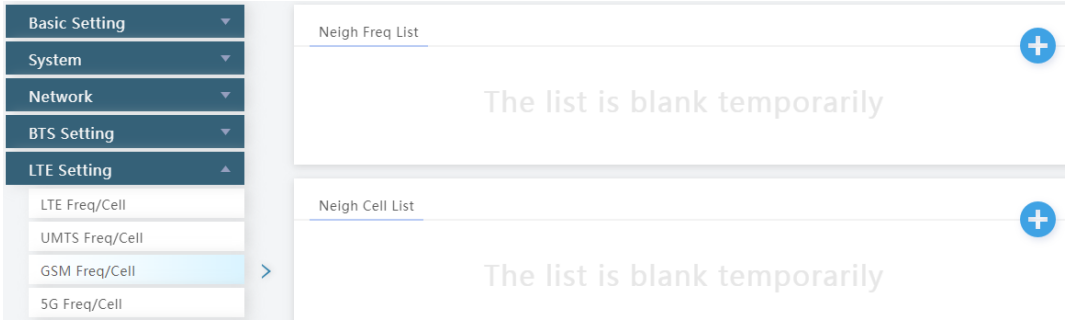
NOTE: If HaloB function is enabled, this menu does not display.

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

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

1. Select “**LTE > GSM Freq/Cell**” to enter the GSM neighbor frequency and cell configuration page, as shown in Figure 3-36.

Figure 3-36 GSM Neighbor Frequency Setting



Users can add, modify, and delete the GSM neighbor frequency and cell. Up to 12 GSM neighbor frequencies and 32 GSM neighbor cells can be set.

GSM Neighbor Frequency

2. In the neighbor frequency list, click  to enter the page for adding a GSM neighbor frequency. The parameter descriptions are given in Table 3-31.

Table 3-31 GSM Neighbor Frequency Parameter Description

Parameter	Description
qRxLevMin(dBm)	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.
Reselection Priority	Priority of the reselection to cells at this 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.
Band	Channels in which the GSM neighbor eNB operates: DCS1800 or PSC1900.
bcchArfcn	ARFCN for GSM neighbor frequency.
pMaxGeran	The allowed max upload transmitted power.

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

GSM Neighbor Cell

4. In the neighbor cell list, click  to enter the page for adding a GSM neighbor frequency. The parameter descriptions as given in Table 3-32.

Table 3-32 GSM Neighbor Cell Parameter Description

Parameter	Description
Enable	Whether enable the neighbor cell.
PLMN	The PLMN that the neighbor cell belongs to.

Parameter	Description
lac	Location area code of the neighbor cell
ci	Identify of a cell, allocated by the operator. ECI = eNB ID*256+cell ID e.g. ECI = 256055, eNB ID=1000,cell ID=55.
Band	Band indicator of the neighbor cell
bcchArfcn	ARFCN of the neighbor cell
bsic	eNodeB identification code of the neighbor cell

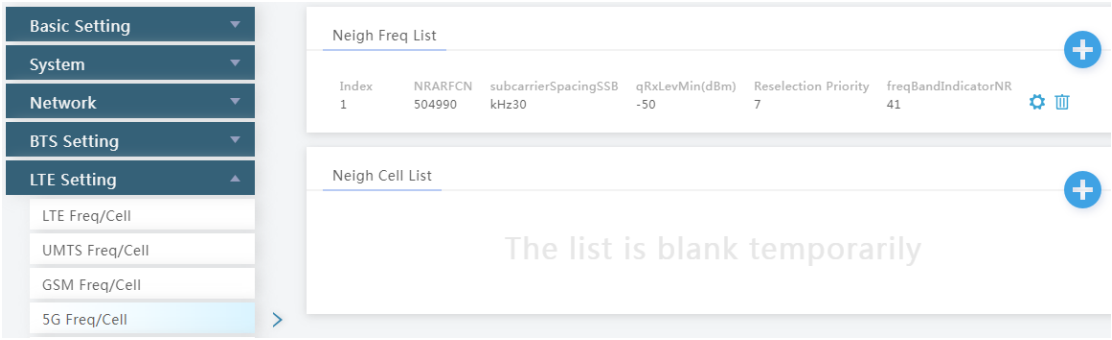
5. Click "**Save**" to complete the GSM neighbor cell setting.

3.7.4 Configure 5G Neighbor Frequency and Cell

NOTE: If HaloB function is enabled, this menu does not display.

1. Select "**LTE > 5G Freq/Cell**" to enter the 5G neighbor frequency and cell configuration page, as shown in Figure 3-37.

Figure 3-37 5G Neighbor Frequency Setting



Users can add, modify, and delete the 5G neighbor frequency and cell.

5G Neighbor Frequency

2. In the neighbor frequency list, click  to enter the page for adding a 5G neighbor frequency. The parameter descriptions are given in Table 3-33.

Table 3-33 5G Neighbor Frequency Parameter Description

Parameter	Description
NRARFCN	Absolute Radio Frequency Channel Number (ARFCN) of the NR neighbor cell.
subcarrierSpacingSSB	Select the sub carrier spacing. • kHz15 • kHz30

Parameter	Description
	• kHz120 • kHz240
qRxLevMin(dBm)	Minimum access level. When the receive signal power of UE is larger than this threshold, the UE can resident on the cell.
Reselection Priority	Priority of the cell reselection to cells at this frequency. Range is 0 to 7 (integer). A typical value is 4.
freqBandIndicatorNR	NR frequency band indicator.

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

5G Neighbor Cell

4. In the neighbor cell list, click ⊕ to enter the page for adding a 5G neighbor frequency. The parameter descriptions as given in Table 3-34.

Table 3-34 5G Neighbor Cell Parameter Description

Parameter	Description
PLMN	The PLMN that the neighbor cell belongs to.
Cell ID	Identity of the neighbor cell. ECI=Cell ID
NRARFCN	Absolute Radio Frequency Channel Number (ARFCN) of the NR neighbor cell.
SSBFrequency	Absolute Radio Frequency Channel Number (ARFCN) of the SSB neighbor cell.
subcarrierSpacingSSB	Select the sub carrier spacing. • kHz15 • kHz30 • kHz120 • kHz240
phyCellId	Physical cell ID.
gNB ID	Identify of the gNB neighbor cell.
TAC	TAC of the neighbor cell.

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

3.7.5 Configure Mobility Parameter

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

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

On the left navigation column, select "**LTE Setting > Mobility Parameter**" to enter the mobility parameter configuration page.

3.7.5.1 A1 Event Threshold

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

1. Click "**A1 Event Threshold**" to display the A1 event threshold configuration parameter.
2. Set the value of "**A1 Threshold - RSRP"**.
3. Click "**Save**" to complete the A1 event threshold setting.

3.7.5.2 A2 Event Threshold

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

1. Click "**A2 Event Threshold**" to display the A2 event threshold configuration parameter.
2. Set the value of "**A2 Threshold - RSRP**".
3. Click "**Save**" to complete the A2 event threshold setting.

3.7.5.3 A3 Event Threshold

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

1. Click "**A3 Event Threshold**" to display the A3 event threshold configuration parameters, which descriptions are given in Table 3-35.

Table 3-35 A3 Event Threshold Parameter Description

Parameter	Description
LTE A3 Offset (*0.5dB)	The A3 event offset in the scenes of the intra frequency handover. Options: -30~30 integer

Parameter	Description
A3 Offfset Anr (*0.5dB)	The A3 event offset in the scenes of the intra frequency ANR handover. Options: -30~30 integer The value must be smaller than the value of "**Intra-Freq Handover A3 Offset**".

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

3.7.5.4 A4 Event Threshold

This version does not support the A4 event setting.

3.7.5.5 A5 Event Threshold

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

1. Click "**A5 Event Threshold**" to display the A5 event threshold configuration parameters, which descriptions are given in Table 3-36.

Table 3-36 A5 Event Threshold Parameter Description

Parameter	Description
Inter-Freq Handover A5 RSRP Threshold1 (v-140dBm)	RSRP threshold parameter 1 of the A5 event. Default is 32. Options: 0~97 integer
Inter-Freq Handover A5 RSRP Threshold2 (v-140dBm)	RSRP threshold parameter 2 of the A5 event. Default is 31. Options: 0~97 integer

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

3.7.5.6 Measurement Control Parameter

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

1. Click "**Measurement Control Parameters**" to display the measurement control

parameters configuration parameters, which descriptions are given in Table 3-37.

Table 3-37 Measurement Control Parameter Description

Parameter	Description
fc	Smoothness factor of LTE measured value. Options: 0,1,2,3,4,5,6,7,8,9,11,13,15
Report interval(ms)	Report interval of measurement result, unit is millisecond. Options: 120,240,480,640,1024,2048,5120,10240,60000,360000,720000 Default is 120.
Hysteresis(*0.5dB)	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 0. In this example, the recommended value is 5dB.
Time To Trigger(ms)	Length of time the target cell RSRP value is better than the serving cell before the UE initiates a handover request.

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

3.7.5.7 Heterostructure Measurement Configuration

When the signal quality of serving cell is lower than a threshold, and signal quality of neighbor cell of heterogeneous structure system is better than a threshold, the B2 handover is triggered.

NOTE: If HaloB function is enabled, this menu does not display.

1. Click "**Heterostructure Measurement Configuration**" to display the heterostructure measurement configuration parameters, which descriptions are given in Table 3-38.

Table 3-38 Heterostructure Measurement Threshold Parameter Description

Parameter	Description
B2 RSRP Threshold1(v-140dBm)	Threshold parameter 1 of the UTRA TDS B2 event Range from 0 to 97 (integer)

Parameter	Description
UTRA B2 IRAT Threshold 2(v-115dBm)	Threshold parameter 2 of the UTRA TDS B2 event Range from -5 to 91 (integer)
GERAN B2 IRAT Threshold2 (v-110dBm)	Threshold parameter 2 of the GERAN B2 event Range from 0 to 63 (integer)
NR B1 IRAT Threshold1(v-156dBm)	Threshold parameter 1 of the NR B2 event Range from 0 to 63 (integer)
Hysteresis (*0.5dB)	This parameter refers to the hysteresis of the different system measurement, the unit is dB. The actual is the configured value x 0.5.
Time To Trigger(ms)	Trigger time of different system event, unit is ms. Options: 0,40,64,80,100,128,160,256,320,480,512,640,1024,1280,2560,5120 Default is 0.
Report Interval	Interval of B2 event report.
Report Interval For Periodic	Interval of periodic report.

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

3.7.5.8 Cell Selection Parameter

1. Click "**Cell Selection Parameter**" to display the cell selection parameters configuration parameters, which descriptions are given in Table 3-39.

Table 3-39 Cell Selection Parameter Description

Parameter	Description
Qrxlevmin (*2dBm)	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 (*2dB)	The minimum level offset (difference) in RSRP at the UE needed for cell selection.

Parameter	Description
	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.
openPhyCellIdStart	The start PCI in open access mode for the eNB.
openPhyCellIdRange	The PCI range in open access mode for the eNB.
hybridPhyCellIdStart	The start PCI in hybrid access mode for the eNB.
hybridPhyCellIdRange	The PCI range in hybrid access mode for the eNB.
csgPhyCellIdStart	The start PCI in closed access mode for the eNB.
csgPhyCellIdRange	The PCI range in closed access mode for the eNB.

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

3.7.5.9 Cell Reselection Parameter

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

1. Click "**Cell Reselection Parameter**" to display the cell reselection parameters configuration parameters, which descriptions are given in Table 3-40.

Table 3-40 Cell Reselection Parameter Description

Parameter	Description
S-IntraSearch(*2dB)	Intra-frequency measurement threshold that must be met before the UE will reselect a neighbor eNB. Range is 0 to 31 (integer). In this example, the recommended value is 31 (integer), which means 31*2 = 62 dB.
S-Non IntraSearch(*2dB)	Inter-frequency measurement threshold that must be met before the UE will reselect a neighbor eNB.
QrxlevminSib3(*2dBm)	The minimum level for reselection. Range is -70 to -22 (integer). In this example, the recommended value is -62 (integer), which means -62*2 = -124 dB.
Reselection Priority	Priority for the reselection. Range is 0 to 7. In this example, the recommended value is4.
ThreshServingLow(*2dB)	Threshold for reselection to cells of lower priority.
pMax(dBm)	Maximum power.
Qhyst(dB)	Delay time for reselection. General the value of the parameter is 2.

Parameter	Description
	This parameter will overestimate the signal strength of the serving cell to delay the cell reselection.
Allowed Meas BW(MHz)	Measurement bandwidth allowed.

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

3.7.5.10 Additional Measurement Parameter

1. In “**Additional Measurement Parameter**” zone, click  to display the configuration parameters, as shown in Table 3-41.

Table 3-41 Additional Measurement Parameter Description

Parameter	Description
mobilityType	The type of measurement. Options: • blind_redirect • irat_data • irat_voice
measEvent	The event of measurement. Options: • EVENT_A2 • EVENT_B2
eutranThresholdRsrp(dBm)	EUTRAN threshold parameter of RSRP for selected event.
eutranThresholdRsrq(dBm)	EUTRAN threshold parameter of RSRQ for selected event.
Hysteresis(*0.5dB)	This parameter refers to the hysteresis of the different system measurement, the unit is dB. The actual is the configured value x 0.5.
Time To Trigger	Delay time of the handover measurement event.
eutranTriggerQuantity(ms)	Trigger quality of mobility measurement of UE caused by the operation of the cell.
A2reportQuantity	The quantity of report of A2 event.
maxReportCells	The max report cells.
reportInterval(ms)	Report interval of measurement result, unit is millisecond.
reportAmount	The amount of reports.
measQuantityUtra	The quantity of utra measurement.
UTRAThresholdRsCP	UTRA threshold of RSCP measurement.
UTRAThresholdEcN0	UTRA threshold of ECN0 measurement.
GERANThreshold	GERAN threshold parameter of selected event.

2. Click “**Save**” to complete the additional measurement parameter setting.

3.7.6 Configure Advanced Parameter

Caution:

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

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

On the left navigation column, select “**LTE Setting > Advanced**” to enter the advanced parameter configuration page.

3.7.6.1 Power Control Parameter

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

1. Click “**Power Control Parameters**” to display the power control parameters configuration parameters, which descriptions are given in Table 3-42.

Table 3-42 Power Control Parameter Description

Parameter	Description
Power Ramping	Step size of the PRACH’s power ramping
Preamble Init Target Power(dBm)	Initial power of PRACH
Po_nominal_pusch(dBm)	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.
Po_nominal_pucch(dBm)	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.
Target ul sinr	The uplink target SNR corresponding the max pass loss.

Parameter	Description
pa	Physical Downlink Shared Channel (PDSCH) is the main data bearing channel. Power bossting the reference signal is allocated to UEs on a dynamic and opportunistic basis. The relative PDSCH power is determined by computed parameters: P_a and P_b. Traffic loading must be balance with controlling interference to neighboring cells.
pb	See description for parameter “PA”.

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

3.7.6.2 eNodeB Setting

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

1. Click “**eNodeB Settings**” to display the eNodeB configuration parameter, which descriptions are given in Table 3-43.

Table 3-43 eNodeB Parameter Description

Parameter	Description
eNodeb Name	An eNB name consists of English letters, numbers and special characters, with a maximum length of 48 characters. By default it is HeNB.
eNodeb Location	The location code of the eNB.
CellType	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. • HeNB: the eNB’s transmission power is much lower than Macro and covers a much smaller area.
relOfMme	S1 connection protocol version. Options: • R8 • R9 • R10
accessMode	Access mode. • ClosedAccess: closed group access • HybridAccess: hybrid group access • OpenAccess: open group access
IMSI access policy-whitelist	Range of IMSIs are allowed to access the eNB.

Parameter	Description
IMSI access policy-blacklist	Range of IMSIs are not allowed to access the eNB.
HeNB PCI Start	The start PCI of the HeNB.
HeNB PCI Range	The PCI range of the HeNB.

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

3.7.6.3 GAP Setting

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

1. Click “**GAP Settings**” to display the GAP configuration parameter, as shown in Table 3-44.

Table 3-44 GAP Setting Parameter Description

Parameter	Description
LTE configuration GAP period	GAP type of LTE measurement. • 40ms • 80ms
3G configuration GAP period	GAP type of UTRAN measurement. • 40ms • 80ms
2G configuration GAP period	GAP type of GSM measurement. • 40ms • 80ms
cdma2000 configuration GAP period	GAP type of CDMA measurement. • 40ms • 80ms
triggerQuantityForBlock	Trigger quality of mobility measurement of UE caused by the operation of the cell.
a4ThresholdRsrpForBlock	RSRP threshold used by A4 event when there is mobility measurement of UE caused by the operation of the cell.
a4ThresholdRsrqForBlock	RSRP threshold NL enable used by A4 event when there is mobility measurement of UE caused by the operation of the cell.

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

3.7.6.4 Random Access Parameters

1. Click "**Random Access Parameters**" to display the random access configuration parameter, which descriptions are given in Table 3-45.

Table 3-45 Random Access Parameter Description

Parameter	Description
Zero Correlation Zone Config	The corresponding configuration of zero correlation, used for generating preamble sequence. • If "Preamble Format" is set to 0, range from 1 to 13. • If "Preamble Format" is set to 4, range from 1 to 6.
PRACH Freq Offset	Set the frequency offset range. The range determined by the band width set in *"3.3 Quick Setting"*. If the value will exceed this range, you need to modify the band width first, and then modify the value of this parameter. • If "carrierBwMhz" is set to "5MHz", range from 0 to 19. • If "carrierBwMhz" is set to "10MHz", range from 0 to 44. • If "carrierBwMhz" is set to "15MHz", range from 0 to 69. • If "carrierBwMhz" is set to "20MHz", range from 0 to 94.
rootSequenceIndex	Index of root sequence. Range: 0 to 837.
Preamble Format	The format of preamble. 0 or 4.
configurationIndex	Index of configuration. The parameter will be sent to UEs through SIB2 message. • If "Preamble Format" is set to 0, range from 1 to 19 integer (5, 7, 8, 11, 13, 14, 17 and 19 are not supported.). • If "Preamble Format" is set to 4, range from 48 to 57 integer.

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

3.7.6.5 Capacity Parameters

1. Click "**Capacity Parameters**" to display the capacity configuration parameter, which descriptions are given in Table 3-46.

Table 3-46 Capacity Parameter Description

Parameter	Description
Max Ue Num	The maximum value of UE.
maxCsgMembers	The maximum of CSG member.

Parameter	Description
resourceReservedForExistingUsers	Reserved UE resource.

2. Click “**Save**” to complete the capacity parameter setting.

3.7.6.6 Scheduling Algorithm

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

Scheduling strategies commonly used are:

- **QOS algorithm**

  Algorithm based on QoS.

- **PF algorithm**

  Balance between user channel quality and fairness, both cell throughput and user fairness taken into account.

- **RR algorithm**

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

1. Click “**Random Access Parameters**” to display the random access configuration parameter, which descriptions are given in Table 3-47.

Table 3-47 Scheduling Algorithms Parameter Description

Parameter	Description
UL Schd Algorithm	MAC uplink scheduling algorithm. Default is Qos. • PF • RR • Qos
DL Schd Algorithm	MAC downlink scheduling algorithm. Default is Qos. • PF • RR • Qos

2. Click “**Save**” to complete the setting of the scheduling algorithm.

3.7.6.7 eNodeB Range Setting

- **Normal**: Compare the total eNodeB_ID. The matching is success when the 20bits of eNodeB_ID is within the setting range.
- **Segment**: Compare the eNodeB_ID segmentation, the minimum segment is 4bits. The upper bound determines the length of segment, such as, the upper bound 7 indicates a segment with 4bits; the upper bound 100 indicates a segment with 8bits (96 is greater than 15, smaller than 255, 4bits is not enough, so that the segment is 8bits). If the segment bit length that needs to be set is greater than the bit length of upper bound expressed, it needs to filled with [0] before the value, each [0] indicates 4bits. If the system need to compare the segment with 12bits, the range from 50 to 200, then the segment need to be filled in [0][50-200]. If some segment need to be ignored, it can be filled with [*] to ignore, each * indicates 8bits. For example, [1-300][*][7-11] indicates, the minimum 12bits is between 1 to 300, the middle 4bits is any value, and the last 4bits is between 7 to 11; [**][0][20-100] indicates, the minimum 8bits is any value, the middle 4bits is 0, and the last 8bits is between 20 to 100.

1. Click "**eNodeB-ID Range**" to display the eNodeB range configuration parameters, which descriptions are given in Table 3-48.

Table 3-48 eNodeB Range Parameter Description

Parameter	Description
Enable	Whether enable the eNodeB ID range function.
enbidType	Type of eNodeB ID. Options: • normal • segment
enbidRange	Range of eNodeB ID to access the cell. The following describes the expression method of eNodeB ID, "-" indicates the upper and lower bound, "-" before is the lower limit, "-" after is the upper limit. Range: 0 to 512

2. Click "**Save**" to complete the setting of the eNodeB ID range.

3.7.6.8 CSFB Select Setting

1. Click "**CSFB Select**" to display the CSFB configuration parameters, which descriptions are given in Table 3-49.

Table 3-49 CSFB Parameter Description

Parameter	Description
CSFB Select GSM	The target selection basis of GSM system. • 0: Make use of build-in default cell (Single DAHO cell) • 1: based on the result of measurement
CSFB Select WCDMA	The target selection basis of WCDMA system. • 0: Make use of build-in default cell (Single DAHO cell) • 1: based on the result of measurement
CSFB Select CDMA2000	The target selection basis of CDMA2000 system. • 0: Make use of build-in default cell (Single DAHO cell) • 1: based on the result of measurement

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

3.7.6.9 RAT Handover Priority

1. Click "**RAT Handover Priority**" to display the RAT handover priority configuration parameters, which descriptions are given in Table 3-50.

Table 3-50 RAT Handover Priority Parameter Description

Parameter	Description
EUTRAN Priority Order	The priority of LTE mode. Options: 0~3
UTRAN Priority Order	The priority of UTRAN mode. Options: 0~3
GERAN Priority Order	The priority of GSM mode. Options: 0~3
CDMA Priority Order	The priority of CDMA mode. Options: 0~3

2. Click "**Save**" to complete the RAT handover priority setting.

3.7.6.10 Web Switch

This function is used for troubleshooting. It does not recommend to be configured by customers.

3.7.6.11 Air Interface Speed Limit Enable

1. Click "**Air Interface Speed Limit Enable**" to display the air interface speed limit window.

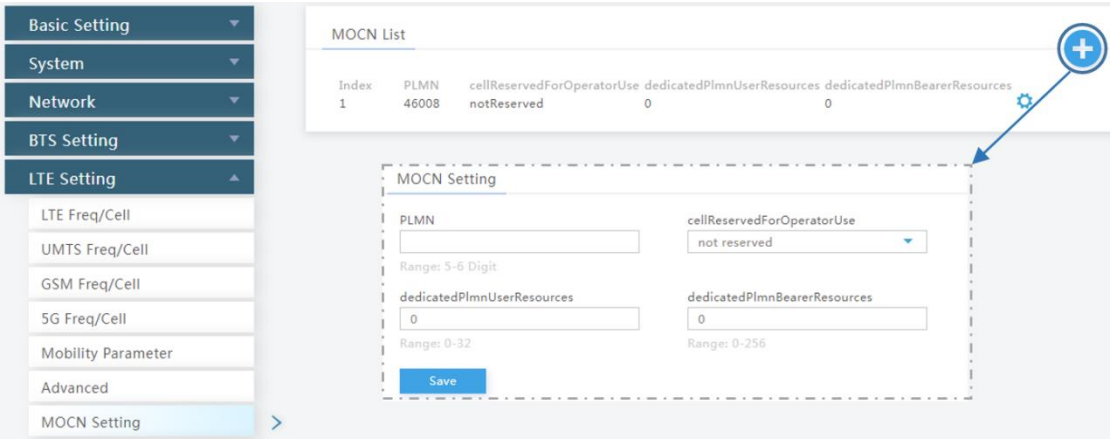
2. Enable the function or not.

3. Click “**Save**” to complete the air interface speed limit setting.

3.7.7 Configure MOCN Parameter

1. On the left navigation column, select “**LTE Setting > MOCN Parameters**” to enter the MOCN parameter configuration page, as shown in Figure 3-38.

Figure 3-38 MOCN Setting



2. Click  on the right corner of the window to display the MOCN configuration parameters, as shown in Table 3-51.

Table 3-51 MOCN Parameter Description

Parameter	Description
PLMN	PLMN assigned by the operator.
cellReservedForOperatorUse	Whether reserved the cell for operator.
dedicatedPlmnUserResources	The dedicated user resources. Range: 0 to 32
dedicatedPlmnBearerResources	The dedicated user bear resources. Range: 0 to 256

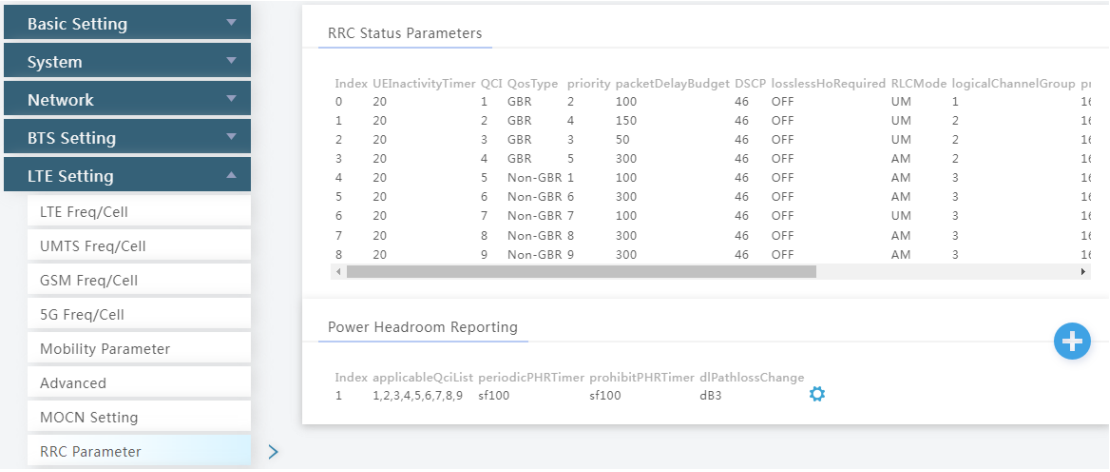
3. Click “**Save**” to complete the MOCN setting.

3.7.8 Configure RRC Status Parameter

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

1. On the left navigation column, select “**LTE Setting > RRC Parameter**” to enter the RRC status parameters page, as shown in Figure 3-39.

Figure 3-39 RRC Status Parameter Setting



2. Click ⚙ to display the RRC configuration parameters, as shown in Table 3-52.

Table 3-52 RRC Status Parameter Description

Parameter	Description
Index	Index of RRC, assigned automatically by the system.
UeInactivityTimer	The duration of timer of the eNodeB released when UE has no service, unit is second. "0" represents disabled the function. (Do not release UE automatically).
QCI	QCI level.
QosType	RRC type. • GBR: Guaranteed Bit Rate • Non-GBR: None Guaranteed Bit Rate
priority	Schedule priority. Range from 1 to 20.
packetDelayBudget	Budget of package delay, unit is millisecond.
DSCP	Select DSCP value.
losslessHoRequired	Lossless handover switch. Enabled or disabled.
RLCMode	RLC transfer mode. UM or AM.
logicalChannelGroup	Select logical channel group.
prioritisedBitRate	Select the priority of bit rate.
bucketSizeDuration	Select the bucket size duration.
trafficOffloadRequired	Enable or disable the traffic offload function. If the LGW is enabled, the parameter should be set to enabled.

3. Click ⊕ on the right corner of the window to display the power headroom report configuration parameters, as shown in Table 3-53.

Table 3-53 Power Headroom Reporting Parameter Description

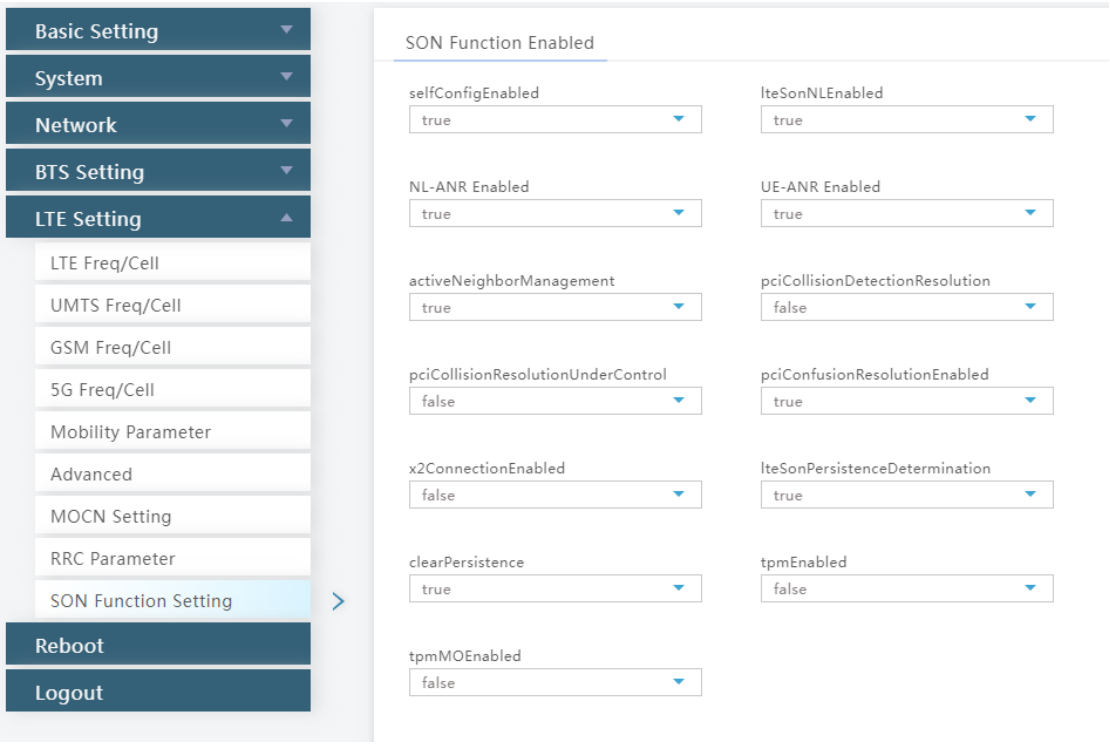
Parameter	Description
applicableQciList	The applicable QCI list.
periodicPHRTimer	Select the period of PHR timer from dropdown list.
prohibitPHRTimer	Select the prohibited period of PHR timer from dropdown list.
dlPathlossChange	Select the threshold of downlink loss path from dropdown list.

5. Click “**Save**” to complete the setting of the RRC status parameters.

3.7.9 SON Function Setting

1. Select “**LTE Setting > SON Function Setting**” to enter the SON function page, as shown in Figure 3-40.

Figure 3-40 SON Function Setting



2. Configuration parameters are given in Table 3-54.

Table 3-54 SON Function Parameter Description

Class	Parameter	Description
SON Function	selfConfigEnabled	When this parameter is set to “**true**”, the PCI conflict detection is allowed. The default value is true.
	lteSonNLEnabled	Whether enable the NL function.

Class	Parameter	Description
	INL-ANREnabled	Whether enable the assisted NL neighbor discovery.
	UE-ANR Enabled	Whether enable the assisted UE neighbor discovery.
	activeNeighborManagement	Whether activate the neighbor management.
	pciCollisionDetectionResolution	Whether enable PCI collision detection resolution.
	pciConfusionResolutionEnabled	Whether enable PCI confusion resolution.
	x2ConnectionEnabled	Whether enable X2 connection function.
	lteSonPersistenceDetermination	Whether enable the SON persistence determination function.
	clearPersistence	Whether enable the SON persistence history data clear function.
	tpmEnabled	Whether enable the TPM function.
	tpmMOEnabled	Whether enable the MOE function.
SON NL Scan	lteCellDetectThreshRsrpForNl	Set the RSRP threshold of neighbor cell scanning.
	lteFreqDetectThreshRssi	Set the RSSI threshold of neighbor frequency scanning.
	qRxLevMinForDetectFreq	Minimum of Rx level for scanned neighbor frequency.
	qQualMinForDetectFreq	Minimum of QQual for scanned neighbor frequency.
	qOffsetForDetectFreq	Quality offset of idle status for scanned neighbor frequency.
	cmOffsetForDetectFreq	Quality offset of connection status for scanned neighbor frequency.
	pMaxForDetectFreq	Maximum transmission power of terminal for scanned neighbor frequency.
	threshXHighForDetectFreq	Srxlev reselection threshold of high priority for scanned neighbor frequency.
	threshXLowForDetectFreq	Srxlev reselection threshold of low priority for scanned neighbor frequency.
	threshXHighQForDetectFreq	Squal reselection threshold of high priority for scanned neighbor frequency.
	threshXLowQForDetectFreq	Squal reselection threshold of low priority for scanned neighbor frequency.
	tReselectionForDetectFreq	Reselection duration for scanned neighbor frequency.

Class	Parameter	Description
Band Scan	scanBandId	ID of the scanned frequency band.
	earfcnStart	Start EARFCN.
	earfcnSpacing	Spacing for frequency band scanning.
	earfcnNumber	Number for frequency band scanning.

2. Click “**Save**” to complete the SON function setting.

3.8 Reboot

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

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

Appendix: Regulatory Compliance

FCC Compliance

Model No.	Description
pBS42020	NeutrinoE224 indoor FDD eNodeB –2x125mW (21 dBm), 2 port, 5 dBi internal antenna, UL2500–2570MHz/DL2620–2690MHz, Band7

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.