ZXSDR B8200 L200 Product Description

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ZXSDR B8200 L200 Product Description

Version	Date	Author	Reviewer	Notes

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1 Overview

1.1 Introduction

This document provides a high level description of ZXSDR B8200 L200 (hereafter B8200) LTE Distributed BaseBand processing Unit (BBU) used in ZTE LTE total Solution.

The document provides an overview of the characteristics of B8200 BBU, its key benefits, the architecture, functionality and services. The document also describes the system capabilities.

The B8200 L200 Product Description is updated regularly under change control.

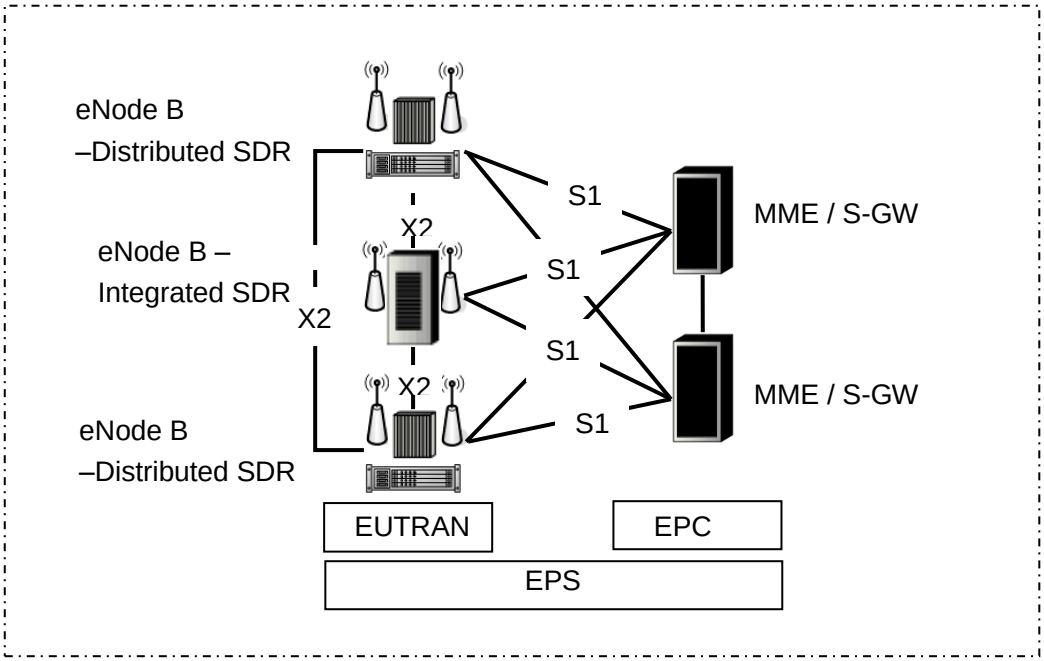
1.2 LTE Network Architecture

This section presents an overview of the LTE network architecture.

LTE is a market driven technology (through operators), which offers higher data rate (150Mbit/s downlink and 50Mbit/s uplink for each cell @ 20MHz, MIMO 2*2) with low latency and short call set up delay that aim to improve end-user throughput, increase cell capacity, reduce user plane latency, and consequently offer superior user experience with full mobility. The flat, all IP-based network architecture and improved spectrum efficiency (2 to 4 times higher compared with HSPA Release 6) have laid the foundation for low cost per bit delivery and overall Capital Expenditure (CAPEX)/Operation Expenditure (OPEX) reduction.

Unlike other latest deployed technologies such as HSPA, LTE is contained within a new Packet Core architecture called Evolved Packet Core (EPC). Technically, 3rd Generation Partnership Project (3GPP) specifies the EPC to support the E-UTRAN. TCP/IP protocols are adopted in EPC, so LTE can support all IP-based services including voice, on-line gaming, IPTV and message with end-to-end Quality of Service (QoS). The EPC network architecture improves the connection and hand-over to other fixed-line and wireless access technologies, which enables operator to deliver a seamless mobility experience.

Figure 1-1 LTE Network Architecture



To achieve all the targets mentioned herein, LTE Physical Layer (PHY) employs advanced technologies that are new to cellular applications, including Orthogonal Frequency Division Multiple Access (OFDMA) and multiple-input and multiple-output (MIMO) data transmission. Furthermore, the LTE PHY deploys OFDMA for the Downlink (DL) and Single Carrier Frequency Division Multiple Access (SC-FDMA) for the Uplink (UL). These technologies will further minimize LTE system and UE complexity while allowing flexible spectrum deployment in the current or new frequency spectrum.

1.3 Benefits

- Multi-Mode Baseband Unit

  B8200 can support all kinds of wireless access technologies simultaneously, including GSM, UMTS, CDMA, WiMAX and LTE, which share the common control function and transmission totally. It fully satisfies operators' need with the minimum hardware change of dedicated baseband processing boards.

- Large Capacity

  B8200 supports different configurations.

With one BPL/BPL1, B8200 supports:

- One BPL: 300Mbps DL / 150Mbps UL (3*20MHz cells in MIMO 2*2)
- One BPL1: 600Mbps DL / 300Mbps UL (6*20MHz cells in MIMO 2*2 or 3x20MHz cells in MIMO 4*4)

B8200 supports larger capacity with more BPL/BPL1 baseband boards

- 900Mbps DL / 450Mbps UL (maximum capacity)

B8200 is hardware readiness to support MIMO 4*4 without Hardware changing. In first GA version, BPL supports MIMO 4*4 in test mode.

According to the application scenario, B8200 can support GSM/UMTS/LTE multi-mode with respective baseband processing boards.

- Baseband Pooling

  B8200 supports Baseband resource pooling function based on carriers. When FS and two or three BPLs are configured, one carrier can be flexibly mapped to any BPL board. However, at the beginning of LTE network deployment, ZTE recommends that only one BPL or one BPL1 is configured in order to reduce the operator's CAPEX investment.

- Plug-in Design for Shelf, Zero Footprint, Convenient Deployment

  B8200 adopts Plug-in design with 19-inch, 2U in height and 7.5 kg in weight. It can be conveniently mounted on the wall, ground, or in the 19-inch rack, etc.

- Flexible Networking

  B8200 provides GE/FE interfaces and IP networking. It supports RRU in different networking modes, like star and chain networking to satisfy the requirements of operators in different environments and under different transmission conditions.

- All-IP Architecture to IP RAN

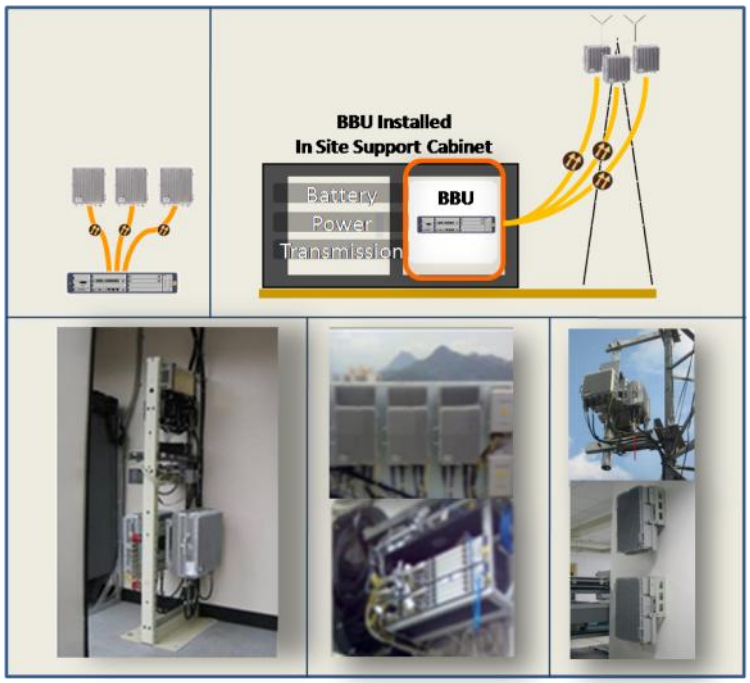
  B8200 adopts IP switching. External GE/FE/E1 interfaces are provided, and IP over E1 mechanism will fit to any transmission scenario.

1.4 Application Scenarios

B8200 and Remote Radio Units (RRU) comprise distributed eNodeB BS8700.

Typical application scenarios of BS8700 are shown in the following figure:

Figure 1-2 BS8700 Application Scenarios



2 Product Architecture

2.1 Physical Structure

Figure 2-1 ZXSDR B8200 L200 Physical Structure

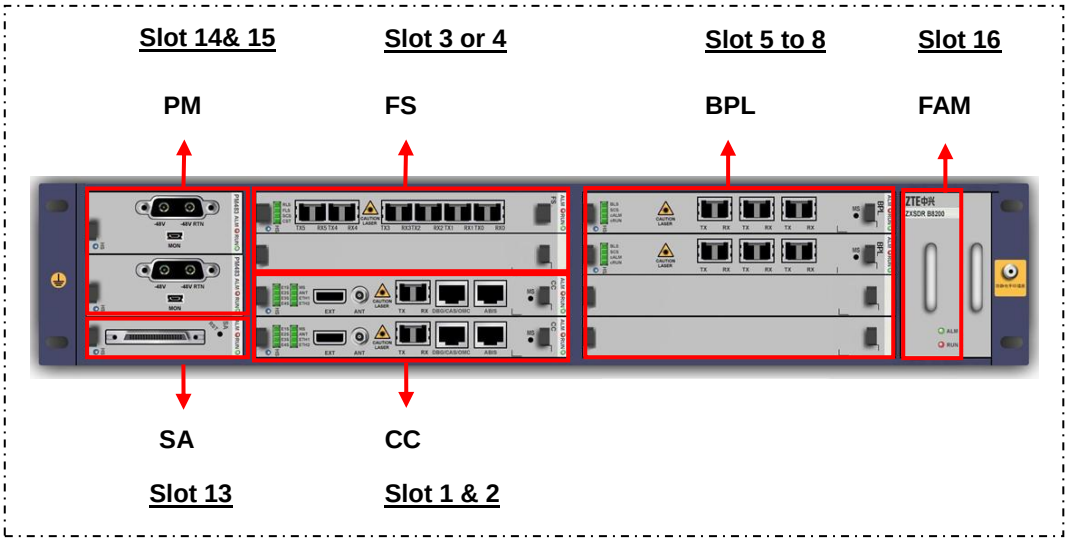


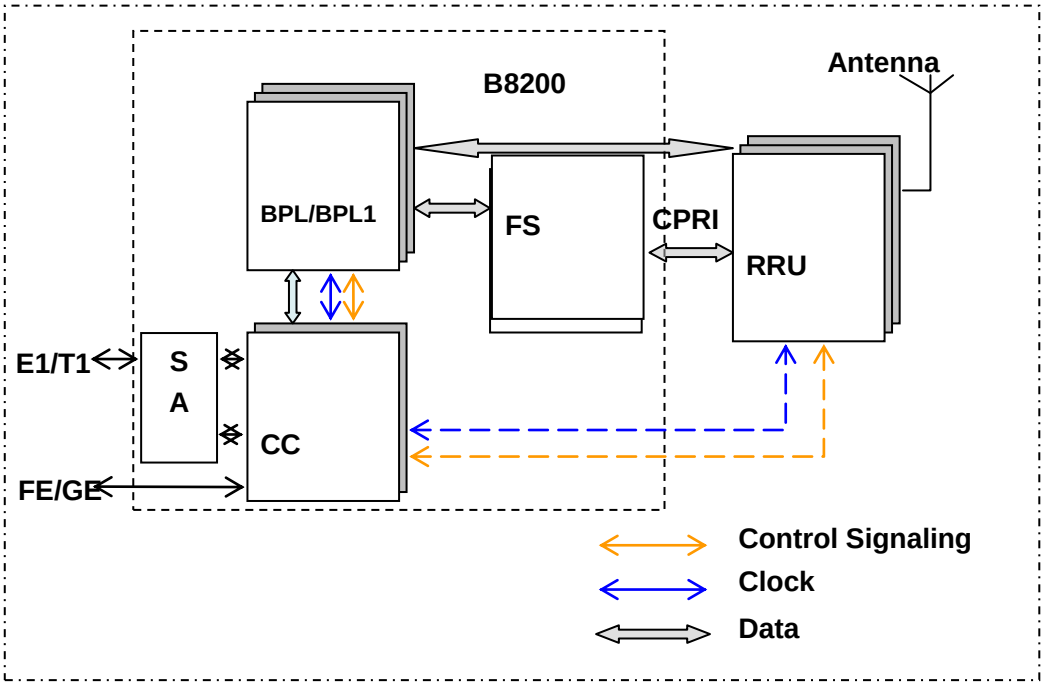
Table 2-1 Board List of B8200

Board Name	Function Description
CC	Control & Clock board, O&M interface, 2 x GE/FE
FS	Fabric Switch board, IQ data switch.
BPL/BPL1 or other BP	Baseband Processing for LTE, or other Baseband Processing boards in case of multi-mode.
SA	Site Alarm board
SE	Site alarm Extension board
UES	Universal Ethernet Switch board
PM	Power Module, dual backup, -48VDC
FAM	Fan Module

2.2 Hardware Architecture

ZXSDR B8200 L200 consists of a Control & Clock board, baseband processing boards, a Site Alarm board, a Power Module, and a Fan Module. The main BBU hardware architecture of B8200 is shown in the following figure.

Figure 2-2 ZXSDR B8200 L200 Hardware Structure



2.2.1 Control & Clock Board (CC)

ZXSDR B8200 L200 can be configured with a maximum of 2 CC boards for 1+1 redundancy.

The CC board has three main functional modules: a GE switch module, a GPS and Clock module, and a transmission module.

The GPS receiver can be integrated in CC board. The GPS and Clock module supports following functions:

- Synchronizing with various external reference clocks, including the GPS clock and the clock provided by Building Integrated Timing Supply (BITS), IEEE 1588, etc.

- Generating and delivering the clock signal to other modules.
- Providing GPS receiver interface and managing the GPS receiver.
- Providing a real-time timing for system operation and maintenance; the real-time timing can be calibrated by O&M or GPS.

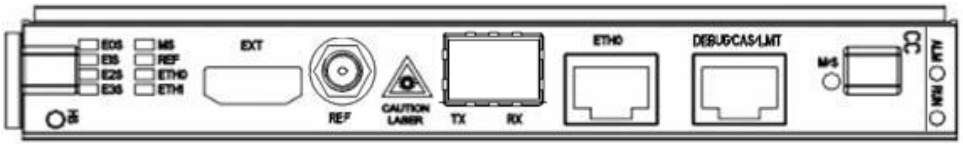
The GE switch and transmission modules supports the following functions:

- Data switching for service data and control flow within the system.
- S1/X2 interface protocol processing.
- Supporting for primary/slave boards hot backup.
- Providing GE/FE physical interfaces.

Other functions:

- Managing software versions of boards and programmable components, and supporting local and remote software upgrades.
- Monitoring, controlling and maintaining of the base station system, and providing Local Maintenance Terminal (LMT) interface.
- Supervising the running status of each board within the system.
- Inventory management.

Figure 2-3 CC Panel



Please refer to Table 2-2 for the description of CC panel interfaces.

Table 2-2 CC Interface & Functionality

Interface	Description

Interface	Description
ETH0	Ethernet interface for S1/X2, GE/FE compatible, electrical
ETH1	Ethernet interface for cascading, debugging or local maintenance, GE/FE compatible, electrical
TX/RX	S1/X2, GE/FE compatible, optical (Eth0 and TX/RX are alternative at the same time)
EXT	External communication port, connected to external receiver
REF	Mainly 485, PP1S+/2M+ interfaces

2.2.2 Baseband Processing Board for LTE (BPL/BPL1)

There are two kinds of LTE baseband board available now. One is BPL, and the other is BPL1. The BPL1 is a new generation baseband boards, and its capability is almost two times of BPL.

ZXSDR B8200 L200 can be configured with 1 to 6 BPL boards. One BPL can deal with 20MHz LTE bandwidth with 3 cells (or any equivalent configurations in terms of throughput), and this configuration can match the requirements of most operators. BPL processes LTE baseband protocol specified by 3GPP R8, R9.

One BPL1 can support 6 cells with 20MHz BW in MIMO 2X2 or 3 cells with 20MHz BW in MIMO4X4. Concerning BBU's capability, 3 BPL1 would be the maximum configuration in the first delivery.

The functions of BPL/BPL1 are listed as follows:

- Processing physical layer protocol.
- Providing uplink/downlink I/Q signal.
- Processing MAC, RLC and PDCP protocol.

Figure 2-4 BPL/BPL1 Panel

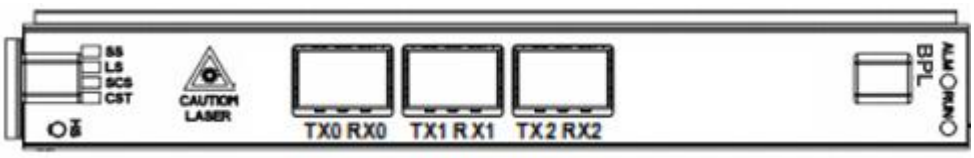


Table 2-3 BPL/BPL1 Panel Interface

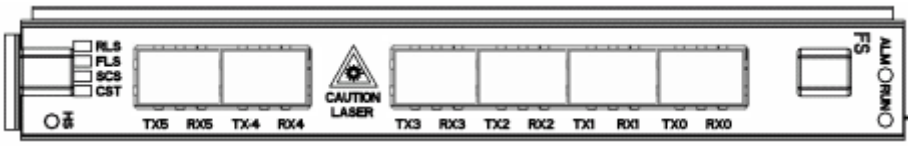
Board Type	Interface	Description
BPL	TX0 RX0 to TX2 RX2	3 pairs of 2.5Gbps (MIMO 2*2)/5.0Gbps (MIMO 4*4) CPRI optical interfaces, connected to RRU/RSU
BPL1	TX0 RX0 to TX2 RX2	3 pairs of 6.144Gbps CPRI optical interfaces, connected to RRU/RSU

2.2.3 Fabric Switch Board (FS)

The fabric switch (FS) board provides baseband optical interface between BBU and RRU/RSU and processes the IQ signal. FS is optional in LTE single mode network.

FS panel is illustrated in the following figure.

Figure 2-5 FS Panel



Description of FS panel interface is shown in the following table.

Table 2-4 FS Panel Interface Description

Interface Name	Description
TX0 RX0 to TX5 RX5	6 pairs of 2.5Gbps (MIMO 2*2)/ 4.9152Gbps(6.144Gbps) (MIMO 2*4) CPRI optical interfaces, connected to RSU/RRU

The FS has the following functions:

- Receive the signal from the rear board in the downlink and retrieve the data and timing.
- Multiplex the received data and retrieve I/Q signal.
- I/Q mapping in the downlink and multiplex I/Q signal to the optical signals.

- Receive the I/Q in uplink and de-multiplex/mapping into I/Q signal.
- Transmit the multiplexed I/Q signal to BP.
- Exchange CPU interface signaling through HDLC interface with RRU/RSU.

2.2.4 Interface Board

2.2.4.1 Site Alarm Board (SA)

SA is a site alarm board, illustrated in the following figure.

Figure 2-6 SA Panel

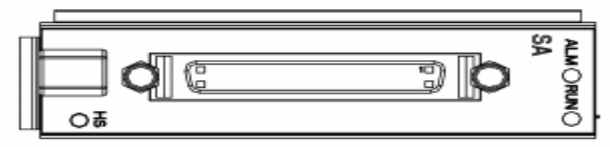


Table 2-5 SA Panel Interface

Interface Name	Description
-	8 E1/T1 interfaces, 1 RS485, 1RS232 interface, 6+2 dry contacts (6 input interfaces, 2 bidirectional interfaces)

ZXSDR B8200 L200 is configured with 1 Site Alarm board.

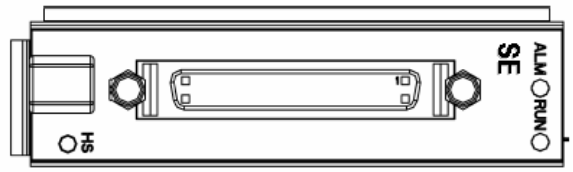
The SA has the following functions:

- Providing FAM's alarm and rate control.
- Providing external interfaces.
- Monitoring serial interface.
- Monitoring boards' temperature.
- Providing dry contacts and the lightening protection for the external interfaces.

2.2.4.2 Site alarm Extension Board (SE)

SE is site alarm extension board, and shares the bottom-right slot with Baseband processing board. It is used to provide additional ports if SA cannot fulfill the requirements. The SE panel is illustrated in the following figure.

Figure 2-7 SE Panel



Description of SE panel interfaces is shown in the following table.

Table 2-6 SE Panel Interface

Interface Name	Description
-	8 E1/T1 interfaces, 1 RS485, 1RS232 interface, 6+2 dry contacts (6 input interfaces, 2 bidirectional interfaces)

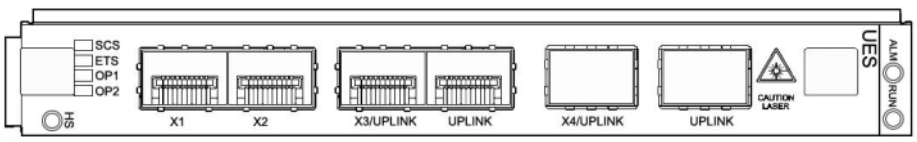
SE board can provide the following functions:

- Providing E1/T1 transmission interfaces for S1/X2.
- Providing site alarm monitoring interfaces.

2.2.5 Universal Ethernet Switch Board (UES)

UES is used for synchronized Ethernet and the panel is illustrated in the following figure.

Figure 2-8 UES Panel



Description of UES panel interfaces is shown in the table below:

Table 2-7 UES Panel Interface

Interface Name	Description
X1–X2	The electrical interfaces for cascaded connection.
X3/ULPINK	A compatible electrical interface for both cascaded connection and uplink connection for link aggregation.
UPLINK	An electrical or optical interface.
X4/UPLINK	A compatible optical interface for both cascaded connection and uplink connection for link aggregation.

UES provides the following functions:

- 6 Ethernet interfaces, including 4 electrical interfaces and 2 optical interfaces
- Supporting L2 Ethernet switch
- Supporting Synchronous Ethernet clock

2.2.6 Power Module (PM)

The Power Module (PM) board is in charge of the presence state detection of all the other boards, providing or removing the power to or from the other boards.

The PM board communicates via the IPMB Bus with the Carrier Manager, which is a MicroTCA-defined logical module running on the CC board.

ZXSDR B8200 L200 can be configured with 2 PM boards, working with 1+1 redundancy mode or load-balancing when the power consumption of the BBU frame is beyond the rated output power of a single PM.

PM has the following functions:

- Providing two kinds of DC output voltage: MP (Management Power, 3.3V) and PP (Payload Power, 12V).
- Reset of all of the other boards in BBU frame under the control of man-machine commands.

- Presence/absence state detection of all the other boards in BBU frame.
- Protection of input over-voltage/under-voltage.
- Output over-current protection and over-load power management.

Figure 2-9 PM Panel

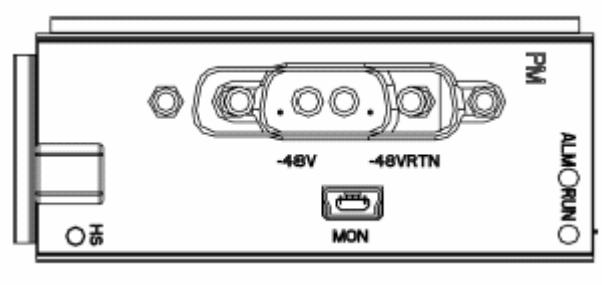


Table 2-8 Power Module Interface & Functionality

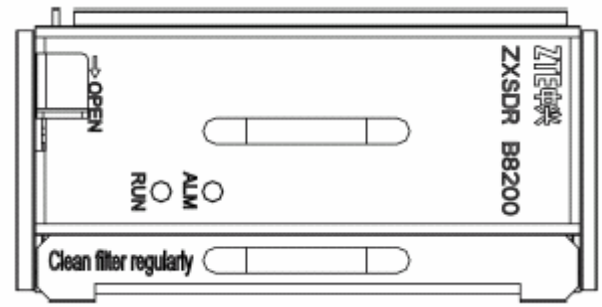
Interface	Description
MON	Debugging interface, RS232 interface
-48V/-48VRTN	-48V input

2.2.7 Fan Array Module (FAM)

ZXSDR B8200 L200 is configured with 1 Fan Module. The main functions of FAM are:

- Fan speed auto-adjustment according to the equipment working temperature.
- Monitor, control and report of fan state.

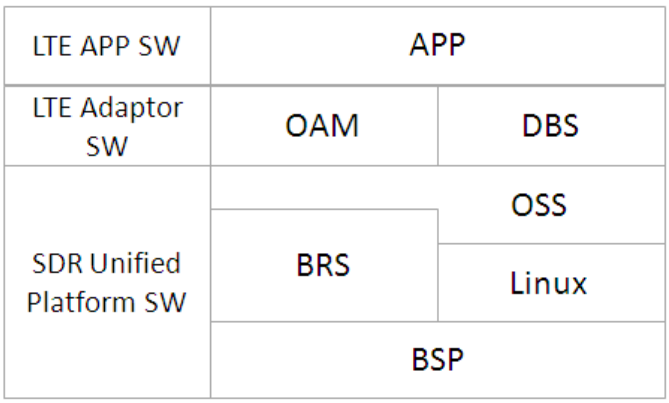
Figure 2-10 FAM Panel



2.3 Software Architecture

The software architecture of B8200 can be divided into three layers: SDR Unified Platform Software, LTE Adaptor Software and LTE Application Software.

Figure 2-11 ZXSDR B8200 L200 Software Architecture



SDR Unified Platform Software provides the functions of Board Support Package (BSP), Operation Support Sub-system (OSS) and Bearer Sub-system (BRS).

- BSP provides the device interface to the Operating System (OS).
- OSS is the support layer in this entire framework, which is a hardware independent platform for running software and provides basic functions like scheduling, timer, memory management, communication, sequencing control, monitoring, alarming and logging.
- BRS provides the IP communication function for inter-boards and inter-network elements.

LTE adaptor software accomplishes the functions of Operating Administration and Maintenance (OAM), and Data Base Sub-system (DBS).

- DBS is the database system.
- OAM provides the configuration, alarm and performance measurement function for LTE eNodeB.

The application layer implements the following LTE functions:

- Radio Network Layer Control Plane (RNLC) provides radio control plane's common and dedicated resource management and control.
- Radio Network Layer User Plane (RNLU) provides user plane function.
- MAC Uplink Scheduler (MULSD) provides uplink MAC scheduling.
- MAC Downlink Scheduler (MDLSD) provides downlink MAC scheduling.
- Physical Layer (PHY) provides LTE PHY function.

2.4 Functionality

ZXSDR B8200 L200 implements the following basic functions on Uu/S1/X2 and O&M interfaces:

- Channel coding and decoding
- Channel multiplexing and de-multiplexing
- Baseband resource pooling function
- Measurement and report
- Power control
- Spatial multiplexing, transmit diversity and receive diversity
- Synchronization
- Frequency hopping
- Operation and Maintenance
- DTX

3 Technical Specifications

3.1 Physical Indices

Table 3-1 Physical Indices

Item	Indices
Size (H*W*D) (mm)	88.4*482.6*197
Weight (kg)	5.25 (Typical Weight) 7.5 (Max Weight)

3.2 Capacity Indices

Two kinds of Baseband Processing Boards can be adopted in B8200. The capacity of B8200 depends mainly on the number of BPL/BPL1 boards configured in the BBU.

With one BPL, B8200 can achieve:

- Throughput: 300Mbps/150Mbps (DL/UL).
- Number of user (RRC_CONNECTED): 1200

With one BPL1, B8200 can achieve:

- Throughput: 600Mbps/300Mbps (DL/UL).
- Number of user (RRC_CONNECTED): 3600

With different configurations the capacity Characteristics will be:

Table 3-2 ZXSDR B8200 Capacity with Different Configurations

Type	Site	BPL Qty.	BPL1 Qty.	Capacity	RRC_CONNECTED User
Typical	3*20MHz cells (MIMO 2*2)	1	0	DL/UL:300/150Mbps	1200

Type	Site	BPL Qty.	BPL1 Qty.	Capacity	RRC_CONNECTED User
Typical	6*20MHz cells (MIMO 2*2)	0	1	DL/UL:600/300Mbps	3600
Higher Performance	6*20MHz cells (MIMO 2*2)	2	0	DL/UL:600/300Mbps	2400
Higher Performance	9*20MHz cells (MIMO 2*2)	3	0	DL/UL:900/450Mbps	3600
Higher Performance	9*20MHz cells (MIMO 2*2)	0	2	DL/UL:900/450Mbps[1]	3600[1]
Higher Performance	3*20MHz cells (MIMO 4*4)	0	1	DL/UL:600/300Mbps	3600

NOTES:

[1] The performance limitation is from Control and Clock board.

3.3 Power Indices

3.3.1 Power Supply

B8200 power supply is shown in the following Table.

Table 3-3 B8200 Power Supply

Power Options	Description
-DC: -48 V (-57 V – -40 V DC)	Supported by integrated PM modules

The power supply is already certified for the following markets.

Table 3-4 Clarification of the B8200 Power Supply

Standard	Country	Reference

Standard	Country	Reference
UL	USA	UL 60950
CSA	Canada	CSA C22.2 No950
CE	Europe	CE mark
PSE	Japan	J60950
TCA	Australia	AS/NZS60950:2000A1
CCC	China	GB4943-2001

3.3.2 Power Consumption

The power consumption depends on traffic load, board configuration and ambient temperature. The following table details the power consumption of all kinds of boards and focuses on the typical power consumption of B8200 at normal ambient temperature.

Table 3-5 Typical Power Consumption of B8200

Item	LTE Typical Configuration	Power Consumption(W)
Rack	1	0
PM	1	15
SA+FAM	1	15
FS	0	17
BPL	0	60
BPL1	1	85
CC	1	20
Total power consumption (W)	135	

3.4 Interface Indices

Table 3-6 B8200 Interface List

Item	Interface	Connector Type

Interface	Item	Index	Connector Type
S1/X2	Ethernet	2	1 RJ45 for Electrical and 1 SFP (LC) for optical
	EXT	1	RS485, can be used as E1 connector or to connect with other external receiver.
	E1/T1	8 Pairs	DB44(Optional)
Baseband/Radio	CPRI	6 Pairs (FS) 3 Pairs (BPL/BPL1)	SFP(LC)
Clock	GPS	1	SMA
Monitor & Alarm	Dry Contacts	6 (Input), 2 (Input/Output)	DB44
	RS485	1	DB44
LMT	Ethernet	1	1 RJ45 for Electrical

3.5 Environment Indices

Table 3-7 B8200 Working Environment Characteristics

Item	Requirement
Temperature	-15 to +50°C
Relative Humidity	5% to 95%；
Protection classification	Compliant with IP20
Emission and Immunity	ETSI EN 300 386
	ETSI TS 125 113
Ground	≤5 Ω; earth resistance can be less than 10 Ω in lightning-less area with less than 20 lightning storms a year.
Storage	Indoor pack deposited
	Temperature: -45 °C to 70 °C

Item	Requirement
	Relative Humidity: 10% to 90%
Mechanical vibration	ETSI 300019-1-4 ClassM4.1

3.6 Electromagnetic Compatibility Indices

Table 3-8 ZXSDR B8200 Electromagnetic Compatibility Characteristics

Item	Requirement
Anti-static protection	Capable of protecting against a contact discharge of ±6000V, Air discharge of ±8000V.
Surge anti-interference	±2000V between lines and ground.

3.7 Reliability Indices

The reliability of the ZXSDR B8200 system conforms with the national military GJB/Z299B Electronic Equipment Reliability Estimation Manual and the IEC TR62390 standard.

Table 3-9 B8200 Reliability Characteristics

Item	Value
MTBF	≥233000 hours
MTTR	0.5 hours
Availability index	≥99.999785%
Down duration	≤1.128 min/year

4 Configurations

4.1 Typical Configuration

B8200 is typically configured with 1 BPL/BPL1 board. This configuration is suitable for the beginning of LTE network deployment.

Following table describes the LTE Baseband configuration.

Table 4-1 B8200 Typical Configuration

Site Type	BPL/BPL 1 Qty	CC Qty	PM Qty	FAM Qty	SA Qty	Capacity
3x20MHz cells (MIMO 2*2)	1 BPL	1	1	1	1	DL/UL:300/150Mbps; 1200 RRC_CONNECTED users
6x20MHz cells (MIMO 2*2)	1 BPL1	1	1	1	1	DL/UL:600/300Mbps 3600 RRC_CONNECTED users

4.2 Higher Performance Configuration

B8200 can support high performance LTE network with more BPL or BPL1 boards. For detail information, refer to Table 4-2.

Table 4-2 ZXSDR B8200 L200 Higher Performance Configuration

Site Type	BPL/BPL 1 Qty	CC Qty	PM Qty	FAM Qty	SA Qty	Capacity
6x20MHz cells (MIMO 2*2)	2 BPL	1	1	1	1	DL/UL:600/300Mbps; 2400 RRC_CONNECTED users

Site Type	BPL/BPL 1 Qty	CC Qty	PM Qty	FAM Qty	SA Qty	Capacity
9x20MHz cells (MIMO 2*2)	3 BPL	1	2	1	1	DL/UL:900/450Mbps; 3600 RRC_CONNECTED users
9x20MHz cells (MIMO 2*2)	2 BPL1	1	1	1	1	DL/UL:900/450Mbps 3600 RRC_CONNECTED users[1]
3x20MHz cells (MIMO 4*4)	3 BPL	1	2	1	1	DL/UL:900/450Mbps; 3600 RRC_CONNECTED users
3x20MHz cells (MIMO 4*4)	1 BPL1	1	1	1	1	DL/UL:600/300Mbps 3600 RRC_CONNECTED users[1]

NOTES:

[1] The performance limitation is from Control and Clock board.

5 Glossary

Abbreviations	Full Characteristics
3GPP	3rd Generation Partnership Project
BP	Baseband Processing
BBU	Base Band processing Unit
BITS	Building Integrated Timing Supply
BPL	Baseband Processing Board for LTE
BPL1	Baseband Processing Board for LTE type1
BSP	Board Support Package
CAPEX	Capital Expenditure
CC	Control & Clock module
CPRI	Common Public Radio Interface
DBS	Data Base Sub-system
DL	Downlink
DTX	Discontinuous transmission
EUTRAN	Evolved Universal Mobile Telecommunications System
FAM	Fan Module
FE	Fast Ethernet
FS	Fabric Switch board
GE	Gigabit Ethernet
GPS	Global Positioning System
GSM	Global System for Mobile communications
HSPA+	HSPA Evolution
LMT	Local Maintenance Terminal
LTE	Long Term Evolution
MDLSD	MAC Downlink Schedule
MicroTCA	Micro Telecommunications Computing Architecture
MIMO	Multi Input Multi Output
MTBF	Mean Time Between Failures
MTTR	Mean Time To Recovery
MULSD	MAC Uplink Schedule

Abbreviations	Full Characteristics
OAM	Operating Administration and Maintenance
OFDMA	Orthogonal Frequency Division Multiple Access
OPEX	Operation Expenditure
OSS	Operation Support Sub-system
PHY	Physical Layer
PM	Power Module
RNLC	Radio Network Layer Control Plane
RNLU	Radio Network Layer User Plane
RRU	Remote Radio Unit
SA	Site Alarm Board
SC-FDMA	Single Carrier Frequency Division Multiple Access
SDR	Software Defined Radio
SE	Site Alarm Extension board
BPL	Base band Processing board for LTE
BPL1	Base band Processing board for LTE type 1
UE	User Equipment
UL	Uplink
UTRAN	UMTS Terrestrial Radio Access Network
WCDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Interoperability for Microwave Access