ZXSDR BS8922

TD-LTE Integrated eNodeB

Product Description

Hardware Version: HV2.1

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LEGAL INFORMATION

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About This Manual

Purpose

This manual provides information about the features, structure, functions, and technical indices of the ZXSDR BS8922 TD-LTE integrated micro base station.

Intended Audience

This manual is intended for:

- Network planning engineers
- System maintenance engineers

What Is in This Manual

This manual contains the following chapters.

Chapter 1, Overview	Describes the product positioning and advantage features.
Chapter 2, System Architecture	Describes the hardware and software architecture.
Chapter 3, Applications and Maintenance	Describes the application scenarios and maintenance methods.
Chapter 4, Technical Indices	Describes the technical indices.
Chapter 5, Environmental Requirements	Describes the environmental requirements.
Chapter 6, Compliant Standards	Describes the international and domestic standards that the product complies with.

Related Documentation

The following documentation is related to this manual:

- *ZXSDR BS8922 TD-LTE Integrated eNodeB Hardware Description*
- *ZXSDR BS8922 TD-LTE Integrated eNodeB Hardware Installation*

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Chapter 1
Overview

Table of Contents

1.1 Product Positioning

Market Positioning

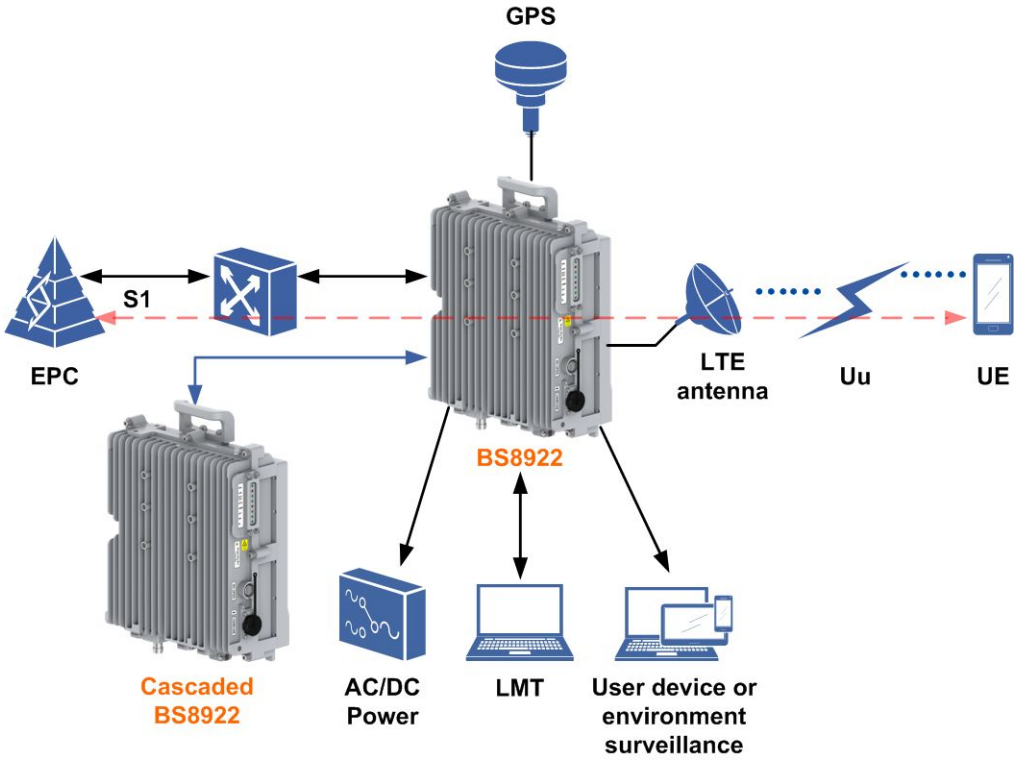
The ZXSDR BS8922, which is an LTE product, is an integrated outdoor micro base station. The ZXSDR BS8922 covers dead spots and hot spots to supplement macro-networks effectively.

The ZXSDR BS8922 has lower requirements for site selection and installation than macro base stations, and can be used for rapid base station construction to reduce costs. The ZXSDR BS8922 is applicable to installation scenarios with no equipment rooms, transmission resource shortage, or limit on equipment size and weight.

Position of the ZXSDR BS8922 in a Network

Figure 1-1 shows the position of the ZXSDR BS8922 in a network. The red dotted-line indicates the data flow when the ZXSDR BS8922 acts as a traditional micro base station.

Figure 1-1 Position of the ZXSDR BS8922 in a Network



For a description of the external systems related to the ZXSDR BS8922, refer to Table 1-1.

Table 1-1 External System Descriptions

External System	Description	Related Interface
EPC	Core network	S1 interface. Physical interface: Ethernet optical interface or Ethernet electrical interface.
Cascade BS8922	BS cascade networking	S1 interface. Physical interface: Ethernet optical interface or Ethernet electrical interface.
LTE antenna	Converts radio frequency signals of RRUs into wireless signals	Antenna interface. Physical interface: N-type connector.
UE	User equipment	Uu interface.
User device or environment surveillance	Implements transparent channel functions, and assists external equipment in transmission networking	Customized. Physical interface: input relay and RS485 interface.
LMT	Local operation and maintenance terminal of the BS	Customized. Physical interface: Ethernet electrical interface.

External System	Description	Related Interface
GPS antenna	Receives GPS signals	GPS signal receiving antenna. Physical interface: coaxial interface.
AC/DC power	Power supply	AC or DC power supply.

1.2 Functions

The ZXSDR BS8922 accomplishes the following basic functions:

- User Equipment (UE) access and radio link transmission including RF processing, channel coding and decoding, channel multiplexing and de-multiplexing, baseband resource pooling function, measurement and report, power control, transmit diversity, receiving diversity, calibration and synchronization.
- LTE radio interface and Evolved Packet Core (EPC) interface processing, mobility management, radio resource management and controlling.
- System management functions including configuration management, alarm management, status checking and system monitoring.
- Supports the configuration of 10 MHz and 20 MHz bandwidth.
- Supports 2T2R.
- Supports 64QAM modulation in both downlink and uplink.
- Spatial diversity, frequency diversity, time diversity, polarization diversity and maximum ratio combination diversity.
- Improves the channel decoding performance and enhances the receive sensitivity by using the Viterbi algorithm.
- Supports Mode 1 and Mode 2 (2DL:2UL, and 3DL:1UL) slot configuration, and supports other configuration modes through software settings.
- Supports special sub-frame 5 and sub-frame 7 (3:9:2, 10:2:2, and 9:3:2), and supports other configuration modes through software settings.
- Supports IPsec and PON public network backhaul.

1.3 Features

The ZXSDR BS8922 has the following features:

- Large Capacity and Easy Expansion

  The ZXSDR BS8922 supports: (The following refers to the maximum capability. The specific capability is limited to the license.)

  → 2 x 5 W output power, and 2T2R

  → A maximum of 2 x 20 MHz cell configuration

  → 111 Mbps DL /30 Mbps UL (site type S1@20 MHz MIMO 2×2)

  → 200 RRC_CONNECTED users

It supports expansion to S1/1/1 with 3 units. 2×5 W TOC and close to antenna installation improves coverage. Compared with traditional indoor, hot spot and rural coverage solutions, it provides higher capacity and coverage.

- High Integration

  Small size, light weight, and easy installation

  Integrated antenna design, and easy deployment

- Unified Platform

  The ZXSDR BS8922 uses the unified SDR platform, supports smooth evolution to future technologies, and reduces the operator investment.

- Green eNodeB

  The ZXSDR BS8922 supports Doherty, Digital PreDistortion (DPD) and MCPA technologies in power amplifier module which provides high Power Amplifier (PA) power efficiency. High efficiency MCPA, natural convection cooling and high density design reduce the power consumption. Zero noise pollution makes it easy for indoor and outdoor installation.

- IP RAN and Rich Interfaces

  It provides FE/GE interfaces, and supports various transmission modes such as PTN/PON microwave.

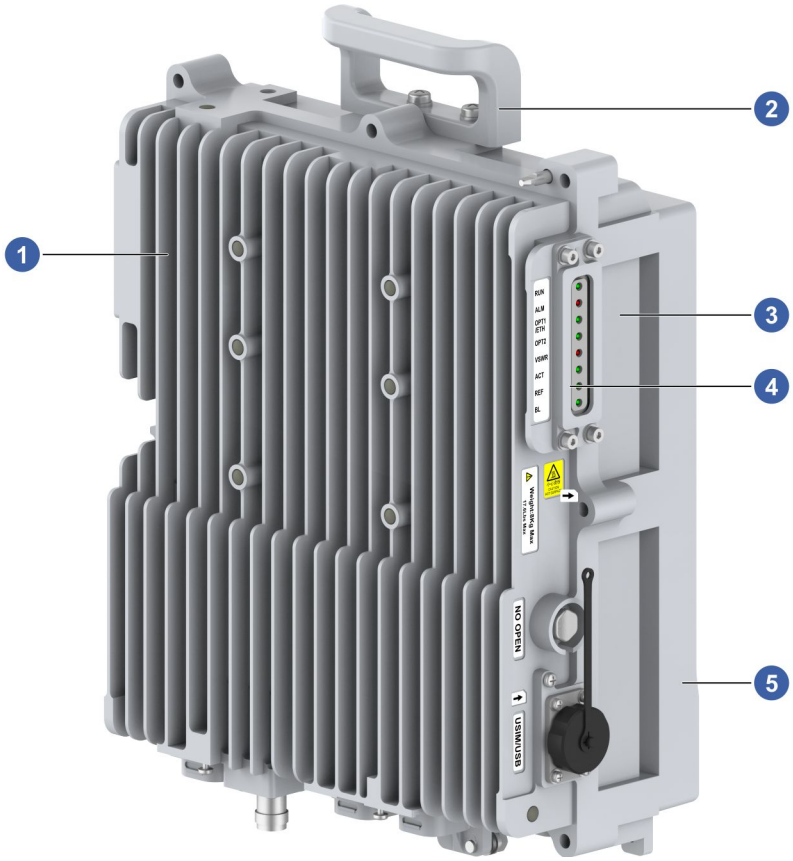
Chapter 2
System Architecture

Table of Contents

2.1 External Structure

Figure 2-1 shows an external view of the ZXSDR BS8922.

Figure 2-1 External View

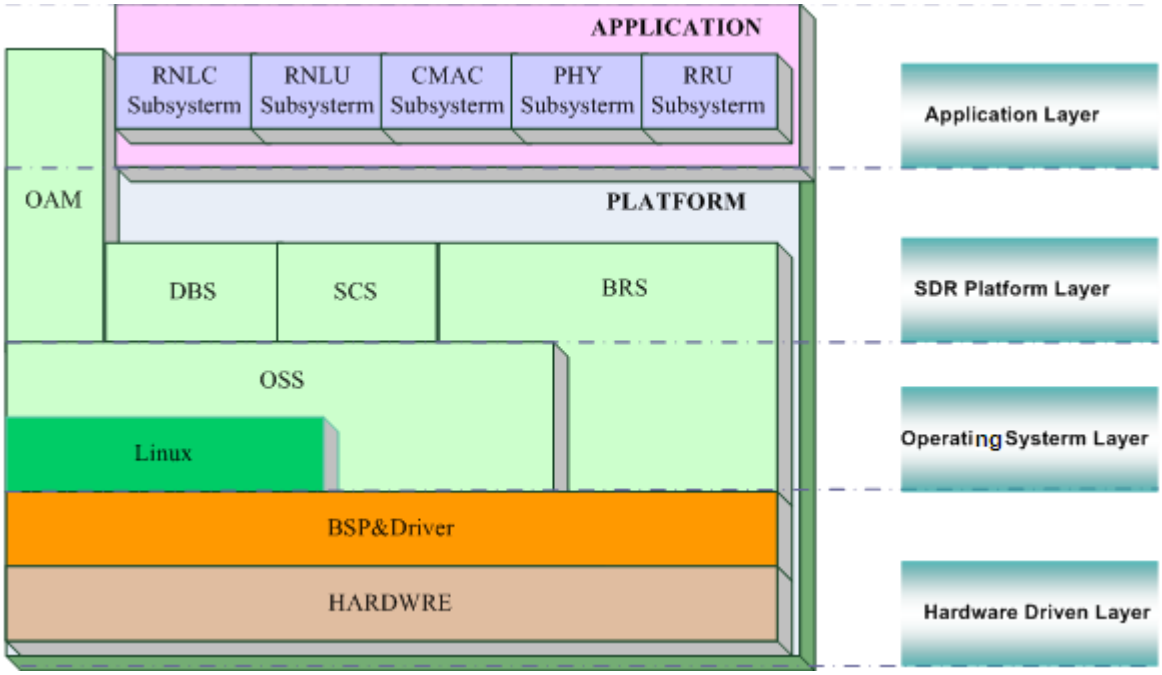


1. Lower chassis body
2. Handle
3. Upper chassis body
4. Indices
5. Maintenance cavity

2.2 Software Architecture

The software architecture of ZXSDR BS8922 can be divided into four layers: Hardware Driven Layer, Operating System Layer, SDR Platform Layer, and LTE Application Layer.

Figure 2-2 Software Architecture



- Hardware Driven Layer

  It provides the functions of Board Support Package (BSP) & Driver. BSP subsystem bootstraps and drives the hardware of the entire system.

- Operating System Layer

  It accomplishes the functions of Operation Support Sub-system (OSS). 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.

- SDR Platform Layer

  The functions of SDR Platform Layer include:

  → Operating Administration and Maintenance (OAM) provides the configuration, alarm and performance measurement function for LTE eNodeB.

  → Data Base Sub-system (DBS) is the database system.

  → Bearer Sub-system (BRS) provides the IP communication function for inter-boards and inter-network elements.

  → System Control Sub-system (SCS) is to control the power supplying and active/standby switching.

- LTE Application Layer

  The functions of LTE Application Layer include:

  → Radio Network Layer Control Plane (RNLC) subsystem provides radio control plane's common and dedicated resource management and control.

- → Radio Network Layer User Plane (RNLU) subsystem provides user plane functions.
- → Control Medium Access Control (CMAC) subsystem provides dynamic resource scheduling of air interface, and it is located in MAC layer.
- → Physical Layer (PHY) subsystem provides LTE Physical Layer functions.
- → RRU subsystem provides LTE radio processing functions.

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Chapter 3
Applications and Maintenance

Table of Contents

3.1 Networking Applications

LTE deployment requires high frequency bands, and causes large consumption. The current base stations cannot reach the 2G/3G coverage level, and relevant eNodeBs should be used to cover dead spots.

For the typical application scenarios of the ZXSDR BS8922, refer to Table 3-1.

Table 3-1 Typical Application Scenarios

Application Scenario	Purpose	Description
Scenario 1	Outdoor coverage hole filling	Covers streets and roads.
Scenario 2	Outdoor hot spot load sharing	Reuses PAS. Deploys micro base stations in the macro base station areas for load sharing.
Scenario 3	Indoor coverage	Covers indoor areas by using micro base stations. Uses the indoor signals as the source of the small-scale DAS indoor distribution system.
Scenario 4	Special application	Applies to government and enterprise applications such as oil drilling platform, military, and police.

For the typical applications of the ZXSDR BS8922 micro base stations, see Figure 3-1 and Figure 3-2.

Figure 3-1 Coverage Holes and Weak Spots of Macro BSs

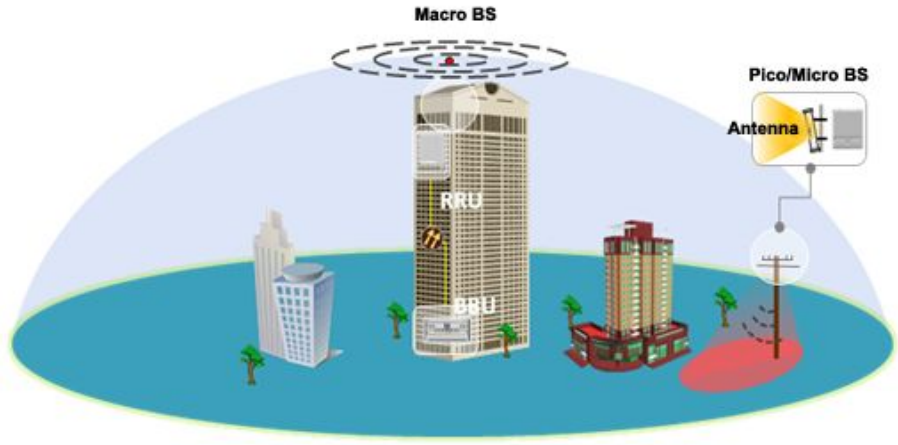
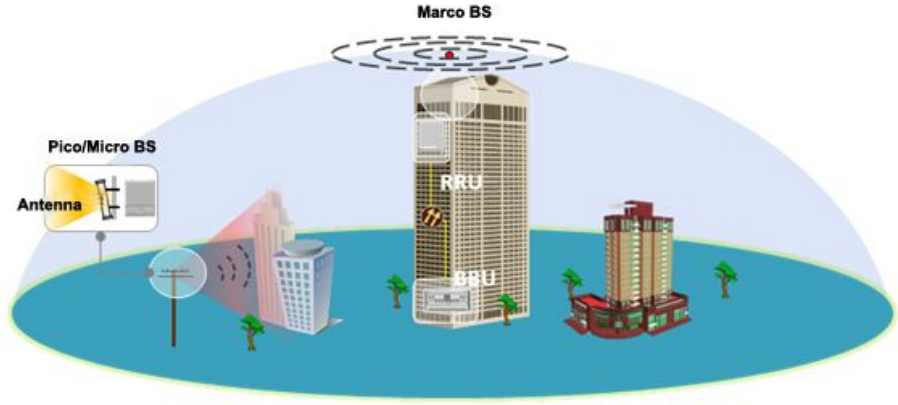


Figure 3-2 Outdoor Penetration and Indoor Coverage



3.2 Operation and Maintenance Methods

The following maintenance methods are used for troubleshooting:

Checking Alarms and Operation Logs

This is the most common method for troubleshooting.

Method: Check the alarm management and operation log windows in the operation and maintenance system.

- In the alarm management window, you can observe and analyze the alarms reported by NEs, such as current alarms, historical alarms, and notifications, discover abnormal network operation, and locate, isolate, and eliminate faults in time.
- By checking the operation logs in user management, you can trace system parameter modification, locate relevant terminals and operators, and discover the faults caused by manual operations.

Performance Analysis

Method: Check the performance management window in the operation and maintenance system.

In the performance management window, you can create performance management tasks and generate performance reports to understand the NodeB system performance indicators.

By analyzing the information, you can learn about load allocation and other network conditions, and modify relevant performance to improve network performance.

Instrument and Meter Analysis

Auxiliary instruments, such as test UE, signaling analyzers, and bit error analyzers, can be used for troubleshooting.

Replacement

You can replace a faulty part with a spare part or a similar part that operates properly in the system to locate a fault.

For the operation methods, refer to the *ZXSDR BS8922 TD-LTE Integrated Micro Base Station Engineering Installation Guide*.

Self-Test

The system performs a self-test when it is powered on again.

During the self-test, the indicators flash in accordance with relevant rules. You can locate faults by checking the indicators.

Integrated Method

In actual operation, all the methods can be used for troubleshooting.

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Chapter 4
Technical Indices

Table of Contents

4.1 Physical Indices

For the ZXSDR BS8922 physical indices, refer to Table 4-1.

Table 4-1 Physical Indices

Item	Index
Dimensions (Height × Width × Depth)	• Overall machine: 310 mm × 290 mm × 90 mm • Including the integrated antenna and the shade: 310 mm × 290 mm × 120 mm
Volume	Bare machine: < 7 L
Weight	• Overall machine: 7 kg • Including the integrated antenna and the shade: ≤ 8 kg

4.2 Performance Indices

For the ZXSDR BS8922 performance indicators, refer to Table 4-2.

Table 4-2 Performance Indices

Item	Index
Operating frequency band	2575 MHz–2635 MHz
Operating bandwidth	40 MHz
Channel bandwidth	5 MHz, 10 MHz, 15 MHz, and 20 MHz
Access capacity	• S1@20 MHz or S11@20 MHz • 111 Mbps DL / 30 Mbps UL @S1 • 222 Mbps DL / 60 Mbps UL @S11 • 600 RRC_CONNECTED users

Item	Index
Mobility	≤ 120 km/h
Output Power (TOC)	2×5 W
Synchronization mode	GPS, IEEE 1588
Receive sensitivity	–103 dBm
Synchronization mode	GPS, IEEE 1588v2, and Uu listening

4.3 Power Indices

For the power indices of the ZXSDR BS8922, refer to Table 4-3.

Table 4-3 Power Indices

Item	Index
Operating voltage	DC: –48 V DC (–60 V DC to –36 V DC)
Power consumption (peak value)	● 120 W@Config DL3:UL1 ● 100 W@Config DL2:UL2

4.4 Environment Indices

For the outdoor operating environment requirements of the ZXSDR BS8922, refer to Table 4-4.

Table 4-4 Environment Indices

Item	Index
Temperature	–40 ℃ through +55 ℃
Relative Humidity	5%–100%
Waterproof/Dustproof	IP65
Heat Dissipation	Natural Cooling
Ground	≤ 10 Ω

4.5 Reliability Indices

For the ZXSDR BS8922 reliability indices, refer to Table 4-5.

Table 4-5 Reliability Indices

Item	Index
MTBF	≥ 200000 hours

Item	Index
MTTR	1 hour
Availability	99.9995%
Downtime Duration	< 2.62 min/year

4.6 Electromagnetic Compatibility Indices

For the ZXSDR BS8922 electromagnetic compatibility indices, refer to Table 4-6.

Table 4-6 Electromagnetic Compatibility Indices

Item	Index
National/International Standard	YD/T 1595.2-2007 ETSI EN 301 489-01,ETSI EN 301 489-23 ETSI EN 300 386–V1.3.2 (CISPR22) Class B Directive 1999/5/EC (R&TTE)

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Chapter 5
Environmental Requirements

Table of Contents

5.1 Operating Environment

For the outdoor operating environment requirements of the ZXSDR BS8922, refer to Table 5-1.

Table 5-1 Operating Environment Indicators

Indicator	Description	
Climatic environment	Operating temperature	–40 through 55 ℃
	Humidity	2%–100%
	Temperature change rate	0.5 ℃/min
	Atmospheric pressure	70–106 kPa
	Solar radiation	1120 W/m^2
	Condensation	Yes
	Precipitation (rain, snow, and hail)	Yes
	Rainfall intensity	6 mm/min
	Rainfall temperature	5 ℃
	Freezing and frost	Yes
	Air movement (maximum wind speed)	50 m/s
Biological environment	Plants	Mold and fungus
	Animals	Rodents and other animals that damage the product, except termites

Indicator	Description		
Chemically reactive substance	Salt fog	Yes	
Mechanically reactive substance	Sand	1000 mg/m^3	
	Dust (floating)	15 mg/m^3	
	Dust (settling)	1000 mg/m^2.d	
Mechanical environment	Steady-state sine oscillation	Offset	1.5 mm
		Acceleration	5 m/s^2
		Frequency	2–9 Hz/9–200 Hz
	Non-steady oscillation including shocks (peak acceleration)	Shock response spectrum L (s)	70 (L) m/s^2
	Earthquake resistance	Magnitude 9	

5.2 Storage Environment

For the environmental requirements for the storage of the ZXSDR BS8922, refer to Table 5-2.

Table 5-2 Storage Environment Indicators

Indicator	Description	
Climatic environment	Temperature	–55 through 70 ℃
	Relative humidity	10%–100%
	Temperature change rate	1 ℃/min
	Atmospheric pressure	70–106 kPa
	Solar radiation	1120 W/m^2
	Condensation	Yes
	Precipitation (rain, snow, and hail)	Yes
	Freezing and frost	Yes

Indicator	Description		
	Air movement (maximum wind speed)	50 m/s	
Biological environment	Plants	Mold and fungus	
	Animals	Rodents and other animals that damage the product, except termites	
Chemically reactive substance	Salt fog	Yes	
Mechanically reactive substance	Sand	300 mg/m^3	
	Dust (floating)	5 mg/m^3	
	Dust (settling)	480mg/m^2.d	
Mechanical environment	Steady-state sine oscillation	Offset	3.0 mm
		Acceleration	10 m/s^2
		Frequency	2–9 Hz/9–200 Hz
	Non-steady oscillation including shocks (peak acceleration)	Shock response spectrum I (a)	100 (I) m/s^2

5.3 Transportation Environment

For the environmental requirements for the transportation of the ZXSDR BS8922, refer to Table 5-3.

Table 5-3 Transportation Environment Indicators

Indicator	Description	
Climatic environment	Temperature	–40 through 70 ℃
	Solar radiation	1120 W/m^2
	Rainfall intensity	6 mm/min
	Humidity	Humid surface
	Air movement (maximum wind speed)	20 m/s

Indicator	Description		
Biological environment	Plants	Mold and fungus	
	Animals	Rodents and other animals that damage the product, except termites	
Chemically reactive substance	Salt fog	Salt water	
Mechanically reactive substance	Sand	100 mg/m^3	
	Dust (settling)	72 mg/m^2.d	
Mechanical environment	Steady-state sine oscillation	Offset	3.5 mm
		Acceleration	10 m/s^2, 15 m/s
		Frequency	2–9 Hz/9–200 Hz/200–500 Hz
	Steady-state random oscillation	Acceleration spectrum density	30 m^2/s^3/3 m^2/s^3/1 m^2/s^3
		Frequency	2–10 Hz/10–200 Hz/200–2000 Hz
	Non-steady oscillation including shocks (peak acceleration)	Shock response spectrum I (a)	300 (I) m/s^2
		Shock response spectrum II (a)	1000 (II) m/s^2
	Free fall	Mass < 20 kg	1.5 m
		20 kg < mass < 100 kg	1.2 m
		Mass > 100 kg	0.5 m
	Topple	Topples over towards any side	

Chapter 6
Compliant Standards

For the national and international standards that the ZXSDR BS8922 complies with, refer to Table 6-1 and Table 6-2.

Table 6-1 National Standards (Including Laws and Regulations)

No.	Name
SJ/T 11363-2006	Requirements for Concentration Limits for Certain Hazardous in Electronic Information Products
GB17625.1-2003	Electromagnetic Compatibility, Limits for Harmonic Current Emissions
GB/Z17625.3-2000	Electromagnetic Compatibility Limits-Limitation of Voltage Fluctuations and Flicker in Low-Voltage Power Supply Systems for Equipment with Rated Current Greater than 16 A
GB 4208-1993	Degrees of protection provided by enclosure (IP code)

Table 6-2 International Standards

No.	Name
3GPP TS	36 series (released in March, 2008)
ROHS_directive_2002_95_EC	DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment
WEEE_directive_2002_96_EC	DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE)
ETSI EN 301 489-01 V1.5.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN 301 489-23 V1.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 23: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) Base Station (BS) radio, repeater and ancillary equipment

No.	Name
EN50385:(2002-08)	Product standard to demonstrate the compliance of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields(110MHz-40GHz)-General public
ETSI EN 301 908-1 V6.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements of article 3.2 of the R&TTE Directive
ETSI EN 301 908-4 V6.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 4: Harmonized EN for IMT-2000, CDMA Multi-Carrier (cdma2000) (UE) covering the essential requirements of article 3.2 of the R&TTE Directive
ITU-T I.361	B-ISDN ATM layer specification
ITU-T I.363.2	B-ISDN ATM Adaptation Layer specification : Type 2 AAL
ITU-T I.363.5	B-ISDN ATM Adaptation Layer specification: Type 5 AAL
ITU-T I.761	Inverse multiplexing for ATM (IMA)
ITU-T G.707/Y.1322	Network node interface for the synchronous digital hierarchy (SDH)
ITU-T I.371.1	Guaranteed frame rate ATM transfer capability
ITU-T G.703	Physical/electrical characteristics of hierarchical digital interfaces
ITU-T G.704	Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels
T1.102-1993	Digital Hierarchy - Electrical Interfaces
T1.403-1999	Network and Customer Installation Interfaces - DS1 - Electrical Interface
ITU-T I.432.2	155 520 kbit/s and 622 080 kbit/s operation
ITU-T I.432.3	B-ISDN user-network interface – Physical layer specification: 1544 kbit/s and 2048 kbit/s operation
ITU-T G.957	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy
T1.105-1995	Synchronous Optical Network (SONET) - Basic Description including Multiplex Structure, Rates and Formats
ANSI INCITS 352	Information Technology Fiber Channel Physical Interfaces (FC-PI)

No.	Name
IEC 60721	Classification of environmental parameters and their severities of electric and electronic products
ISO 3744	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane
ETSI 300 753	Equipment Engineering (EE) Acoustic Noise Emitted by Telecommunications Equipment
EN 50385	Product standard to demonstrate the compliance of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110MHz-40GHz)-General public
PIGMG	Micro Telecommunication Computing Architecture Base Specification RC1.0 2006

FCC&IC STATEMENT

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

NOTE **Note:**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 1.6m between the radiator & your body.

Glossary

64QAM
- 64 Quadrature Amplitude Modulation

AC
- Alternating Current

BRS
- Bearer Subsystem

BS
- Base Station

BSP
- Board Support Package

CMAC
- Control Mobile Attenuation Code

DAS
- Distributed Antenna System

DBS
- Database Subsystem

DC
- Direct Current

DPD
- Digital Pre-Distortion

EPC
- Environment Power Control Card

EPC
- Evolved Packet Core

FE
- Fast Ethernet

GE
- Gigabit Ethernet

GPS
- Global Positioning System

LMT
- Local Maintenance Terminal

LTE
- Long Term Evolution

MCPA
- Multi-Carrier Power Amplifier

MIMO
- Multiple-Input Multiple-Output

MTBF
- Mean Time Between Failures

MTTR
- Mean Time To Recovery

OSS
- Operating System Subsystem

PA
- Power Amplifier

PAS
- Personal Access System

PHY
- Physical layer

PON
- Passive Optical Network

PTN
- Packet Transport Network

RNLC
- Radio Network Layer Control Plane Subsystem

RNLU
- Radio Network Layer User Plane Subsystem

RRU
- Remote Radio Unit

SCS
- System Control Subsystem

SDR
- Software Defined Radio

TD-LTE
- Time Division Long Term Evolution

UE
- User Equipment

eNodeB
- Evolved NodeB