Operator Logo

ZXSDR FDD R8882 Product Description

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1 Overview

1.1 Introduction

This document provides a high level description of ZTE ZXSDR R8882, which is one LTE distributed RRU (Remote Radio Unit) used in ZTE LTE total solution.

The document is designed to give an overview of the characteristics of R8882, its key benefits, the architecture, functionality and services. The document also describes the system capabilities.

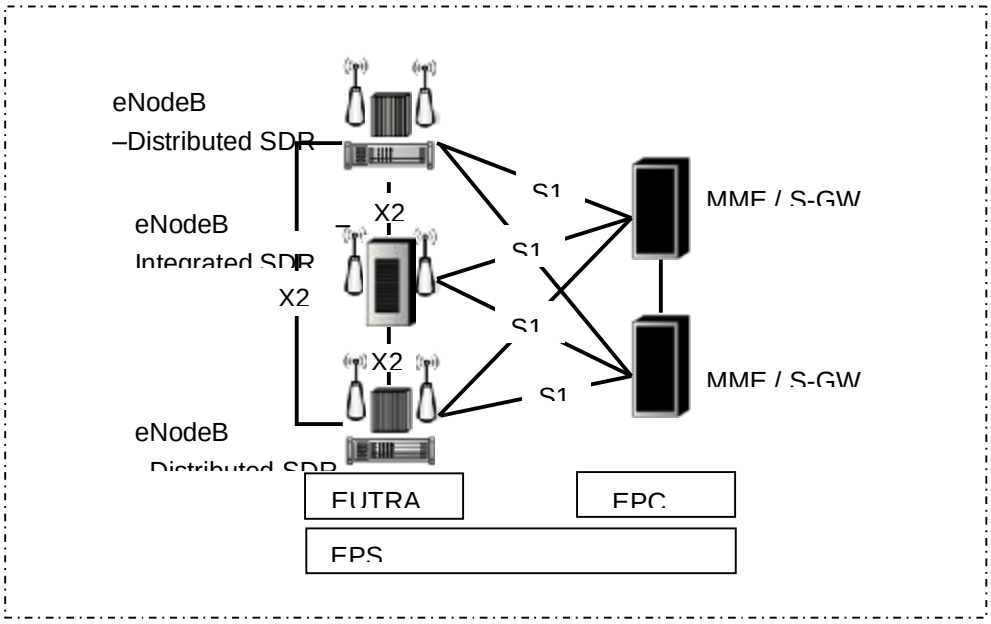
1.2 LTE Network Architecture

This chapter aims to present an overview of LTE network architecture.

LTE is a market driven technology (through operators), which offers higher data rate (100Mbit/s downlink and 50Mbit/s uplink) with low latency and short 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 CAPEX/OPEX reduction.

Unlike other latest deployed technologies such as HSPA, LTE is contained within a new Packet Core architecture called EPC (Evolved Packet Core) network architecture. Technically, 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 QoS (Quality of Service). The EPC network architecture can improve 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 PHY (Physical Layer) employs advanced technologies that are new to cellular applications, including OFDMA (Orthogonal Frequency Division Multiple Access) and MIMO (Multiple-Input and Multiple-Output) data transmission. Furthermore, the LTE PHY deploys the OFDMA for the downlink and SC-FDMA (Single Carrier Frequency Division Multiple Access) for the uplink. These technologies will further minimize the LTE system and UE complexities while allowing flexible spectrum deployment in the existing or new frequency spectrum.

1.3 Benefits

SDR (Software Defined Radio) is the evolution of base station technology. ZTE has put more effort and manpower on this new technology for many years, and released the R8882 RRU product and B8200 BBU product based on SDR technology..

Operators can benefit a lot from ZTE's SDR platform. The following list summarizes key benefits for operators.

- Clearer and Simpler Network:

Instead of running hardware independent platforms for each technology, operators can have various wireless technologies implemented in software on the same hardware platform.

- Lower TCO (Total Cost of Ownership):

  Fewer engineers are required since there is a single platform to manage and maintain. The operational expenditures are kept to minimum compared to running several hardware platforms.

  The TCO for a mobile network is much lower in performing upgrades for the new wireless technology due to multi-technology deployment supported by SDR-platform.

- Lower Investment Risk:

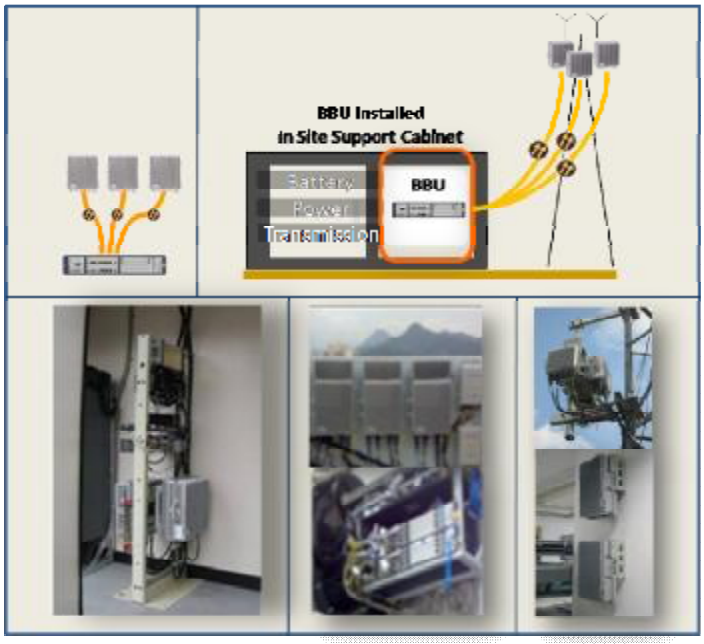
  Since hardware platforms can be reused, there is significantly less investment risk for deploying hardware. Wireless technologies develop so fast, and investing on one technology only may bring risk to operators. SDR-based solutions will decrease the investment risk since SDR platform can support various technologies.

1.4 Application Scenarios

R8882 as the remote radio unit and Baseband Unit (BBU) comprise distributed macro eNodeB BS8700.

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

Figure 1-2 BS8700 Application Scenarios



2 Highlights

2.1 Wider Bandwidth

The R8882 is based on ZTE owned MCPA technology, and maximum IBW can reach to 40MHz.

Table 2-1 describes detailed bandwidth information to every kind of R8882.

Table 2-1 R8882 bandwidth parameter

R8882	700M B12/17	700M B13/14	DD B20	850M B5	900M B8	1.8G B3	1.9G B2	AWS B4	2.1G B1	2.6G B7
Naming	R8882 S7000	R8882 S7100	R8882 S8000	R8882 S8500	R8882 S9000	R8882 S1800	R8882 S1900	R8882 S1700	R8882 S2100	R8882 S2600

Power(W)	2X40	2X40	2X40	2X60	2X60	2X60	2X60	2X60	2.1.1 2 X60	2.1.2 2 X40
Work BW(MHz)	20	20	30	25	35	75	60	45	60	70
IBW TX (MHz)	20	20	30	25	35	40	30	40	40	40
IBW RX (MHz)	20	20	30	25	35	55	40	40	60	40

2.2 MIMO Supported, Better Performance

ZXSDR R8882 supports 2T4R in one box, which can optimize spectrum efficiency greatly and improve network uplink performance; As a result, it brings better customer experience. Zero Footprint, Easy Deployment

- ZXSDR R8882 2*40W is less than 17L in volume and 20Kg in weight;
- R8882 2*60W is less than 23L in volume and 24Kg in weight;
- It is portable to transport and flexible to install on the pole, tower and wall, thus reducing OPEX.

2.3 Higher Efficiency, Lower TCO

- ZXSDR R8882's PA efficiency can reach up to 40% thanks to the most advanced Doherty PA, DPD linear technology and MCPA technology.;
- It supports dynamic adaptive PA power supply due to the output power, which reduces power consumption.
- It is passive thermal dissipation designed, so it is power saving and less noisy.

2.4 Integrated Light protection unit

ZXSDR R8882 supports integrated Lighting protection unit (PWR), and the protection level is 15KA.

3 Functionality

R8882 is the remote radio unit of distributed base station. The signal is transmitted /received through R8882 to/from base band processing unit for further processing via standard CPRI interface.

By applying the distributed system, the feeder loss will be eliminated when the radio unit is positioned close to the antenna. The coverage is enlarged with this solution.

The functions of R8882 include:

- Support the configuration of 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz scalable bandwidth;
- The Instantaneous Bandwidth (IBW) of ZXSDR R8882 is 40MHz, so R8882 can deal with 2 separate 210M bandwidths except 700M, DD and 900M. IBW means the instantaneous processing capability of the Digital Intermediate Frequency (DIF) and Digital Predistortion (DPD) for the carrier bandwidth in RRU;
- Band Supported: 700/DD/900/AWS/1800/1900/2100/2600MHz(different RF hardware for different frequency)
- Supports 2T4R in one box which can optimize spectrum efficiency greatly and improve network uplink performance ;
- Supports 64QAM modulation in both downlink and uplink;
- Support transmit power report function for every carrier;
- Support overload protection function for power amplifier;
- Support transmit channel switching on/off function;

- R8882 software failure will not affect the running of BBU and other R8882s which are connected to it.

4 System Architecture

4.1 Product Physical Structure

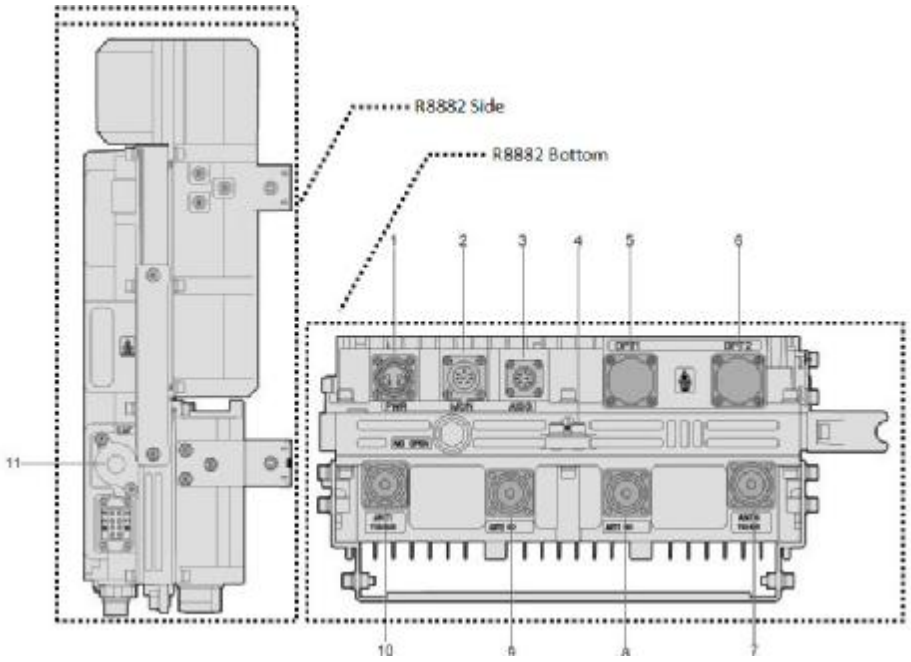
Figure 4-1 ZXSDR R8882 (2*40W) Appearance

Figure 4-2 ZXSDR R8882 (2*60W) Appearance

4.2 External Interfaces

All R8882 external interfaces are located at the bottom of the box, which are shown in the following figure.

Figure 4-3 External Interfaces of R8882



The descriptions of all the interfaces are listed in the following table:

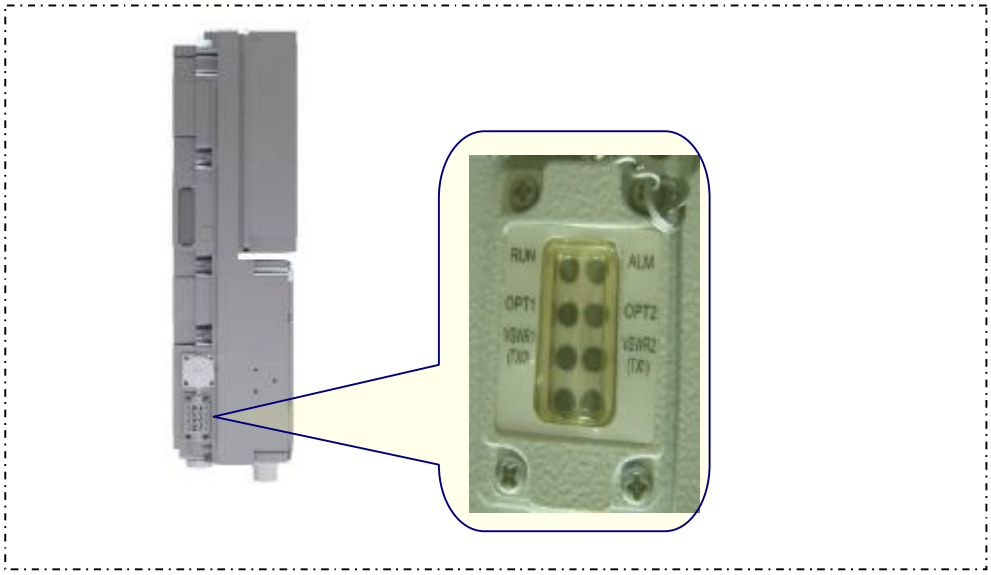
Table 4-1 Description of External Interfaces

S.N.	Label	Interface	Interface Type/Connector
1	PWR	Power supply interface	2-pin round plastic connector (male)
2	MON	External device interface	8-pin circle connector
3	AISG	AISG interface	8-pin circle connector (IEC 60130-9-ED)
4	GND	PE interface	16 mm2 yellow-green round terminal

5	OPT1	BBU and RRU Interface/RRU cascading interface	LC-mode optical interface (IEC 874)
6	OPT2	BBU and RRU Interface/RRU cascading interface	LC-mode optical interface (IEC 874)
7	ANT1(TX0/ RX0)	Interface to transmit/receive diversity RF cable	50 Ω DIN-mode connector
8	ANT2(RX2)	Interface to receive diversity RF cable	50 Ω DIN-mode connector
9	ANT3(RX3)	Interface to receive diversity RF cable	50 Ω DIN-mode connector
10	ANT4(TX1/ RX1)	Interface to transmit / receive diversity RF cable	50 Ω DIN-mode connector
11	LMT	Local maintenance terminal	Ethernet interface

Additionally, on its side panel R8882 provides 6 LED indicators at the left side at the bottom. The LED indicators are to show the working status and for the alarm, as shown in 0.

Figure 4-4 R8882 LED Indicators



For descriptions about LED indicators please refer to 0.

Table 4-2 Description of Flashing Indicators and Buttons

Label	Meaning	Working mode
RUN	Running	A: Normal ON: reset and start state B: 1Hz flashing: normal state C: 5Hz flashing: version download process D: Off: indicates self-test failed
ALM	Alarm	A: Off: indicates no failure during running, or resetting/starting or downloading version B: 5Hz flashing: major or urgent alarm C: 1Hz flashing: normal or minor alarm
Link1	Optical Link 1	A: Normal ON: optic fiber connection is normal B: Off: optic fiber is disconnected C: 5Hz flashing: this link is clock reference source, and the phase-lock loop is in quick pull-in state. D: 0.25Hz flashing: this link is clock reference source, and the phase-lock loop is in tracking state.
Link2	Optical Link 2	A: Normal ON: optic fiber connection is normal B: Off: optic fiber is disconnected C: 5Hz flashing: this link is clock reference source, and the phase-lock loop is in quick pull-in state. D: 0.25Hz flashing: this link is clock reference source, and the phase-lock loop is in tracking state.
VSR1	RF 1 State	A: Greed On: no alarm B: Red On: alarm
VSR2	RF 2 State	A: Greed On: no alarm B: Red On: alarm
	Free	Two LTE are reserved for future application

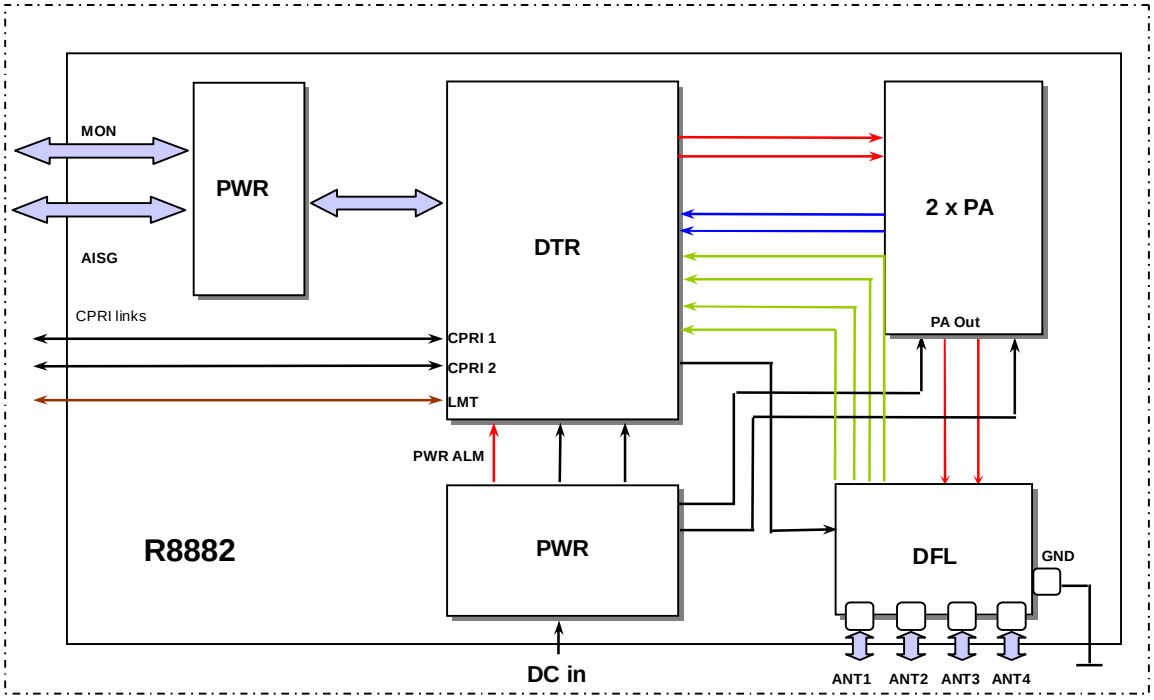
4.3 Hardware Structure

R8882 includes 5 main hardware modules::

- DFL (Duplex Filters LNA)
- 2xPA (Power Amplifier)
- RPDC (RRU Power for DC)
- DTR board (Dual-channel Transceiver)
- PWR board(lightning protection module and power supply)

The hardware structure of R8882 is shown in Figure 4-5.

Figure 4-5 R8882 System Structure



4.3.1 DTR (Dual-channel Transceiver)

The DTR has following functions:

- Process 4 received signals and 2 transmitted signals;
- Radio signal Up/Down Conversion

- Downlink IQ signal multiplexing and uplink signal de-multiplexing;
- Signal amplifying, filter, A/D conversion and D/A conversion;
- Convert between optical and electric signal;
- Capture reference clock signal from baseband unit and provide clock signal to other units;
- VSWR (Voltage Standing Wave Ratio) measurement and report;
- Hardware failure self-detection and alarm;
- Over-heat detection and alarm;
- Provide communication interfaces, 2 CPRI interfaces, 2 dry contacts, one RS485 serial port for external monitor equipment communication, 1 AISG for electrical tilt antenna, and 1 fast Ethernet port for LMT;
- Reset function.

4.3.2 DFL (Duplex Filter LNA)

The DFL has following functions:

- Combine and isolate transmitted and received signals;
- Filter the transmitted signal and received signal;
- LNA (low-noise-amplifier) function;
- Provide DFL alarm monitor function.

4.3.3 PA (Power Amplifier)

The PA has following functions:

- Perform radio signal amplifying function;
- Temperature report function;

- Over-current, over-heat, over-power and over-standing wave protecting function.

4.3.4 PWR (Lightning protection module and power supply)

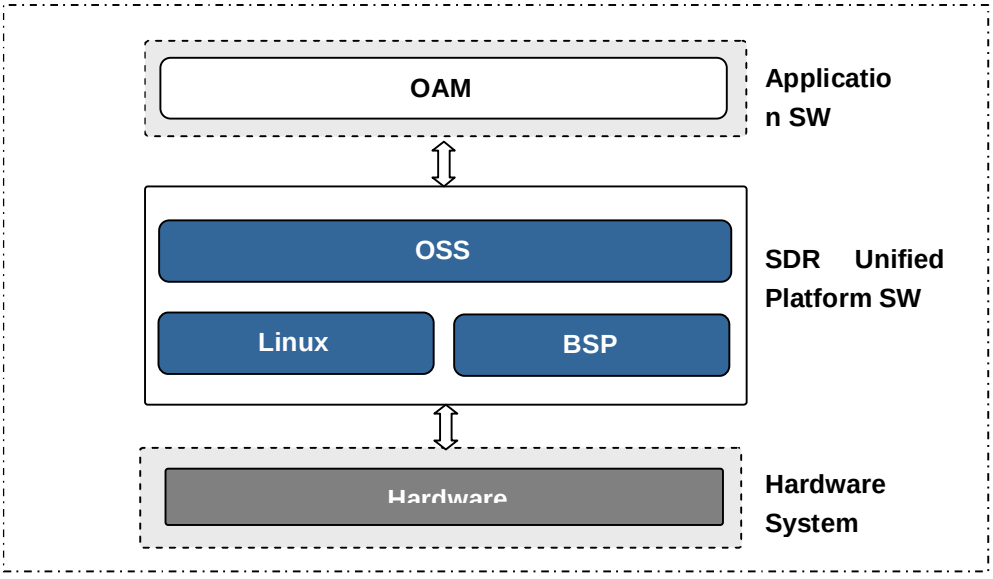
The PWR has following functions:

- Provide power supply function;
- Monitor input over-voltage/under-voltage, input power outage, output over-voltage/under-voltage, output over-current alarm, and report it to DTR board.
- Lightning protect for the AISG, RS485 and dry contacts.

4.4 Software Architecture

The software architecture of R8882 can be divided into two layers: SDR Unified Platform Software and Application Software. The architecture is shown in the following 0:

Figure 4-6 ZXSDR R8882 Software Architecture



The OAM (Operating Administration and Maintenance) sub-system is the application layer. Its main functions contain software downloading, configuration, management, system maintenance and measurement.

The OSS (Operation Support Sub-system) is the supporting 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.

The Linux is the operating platform communicating to the hardware components.

The BSP (Board Support Package) provides device driver & initiation and supports basic functions like alarming and monitoring. It also provides the relating interfaces and services to the operating system.

5 Technical Specifications

5.1 Physical Characteristics

Figure 5-1 ZXSDR R8882 (2*40W) Appearance

Figure 5-2 ZXSDR R8882 (2*60W) Appearance

5.1.1 Mechanical Dimension

R8882 2*40W is 380x320x140mm in H x W x D (17 Liter); and R8882 2*60W is 480x320x150 in H x W x D (23 Liter)

5.1.2 Weight

The weight of R8882 2*40W is less than 20Kg when supporting 2T4R; the weight of R8882 2*60W is 24Kg when supporting 2T4R.

5.1.3 Color

Color: silver gray

5.2 Bandwidth

ZXSDR R8882 supports all LTE bandwidth:

1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz

Besides, the hardware can support 40M bandwidth..

5.3 Performance

5.3.1 Operation Frequency Band

Table 5-1 ZXSDR R8882 Operation Radio Frequency Band

Type	Operation Radio Frequency Band(MHz)
R8882 2*40W	700/DD/2600
R8882 2*60W	850/900/1800/1900/AWS/2100

5.3.2 RRU Output Power

Table 5-2 ZXSDR R8882 RRU Output Power

Mode	Type	PA Output Power	TOC Output Power
LTE	R8882 2*40W	2x54W	2x40W
LTE	R8882 2*60W	2x75W	2x60W

5.3.3 Receiver Sensitivity

- -106dBm @ LTE single antenna
- -108.6dBm @ LTE double antennas
- -111dBm @ LTE four antennas

5.4 Power

5.4.1 Power Requirements

R8882 adopts a fully decentralized power supply, compatible with -48V DC (-35 to-60V DC).

The box should have perfect grounding performance with the grounding resistance < 5Ω.

5.4.2 Power Consumption

Table 5-3 R8882 (2*40W) Power Consumption on Different Frequency Bands

Item	700M(B12,B13,B14,B17),DD(B20)	2.6G(B7)
Typical power consumption(W)	195W	225
Maximum power consumption(W)	325W	385

Table 5-4 R8882 (2*60W) Power Consumption on Different Frequency Bands

Item	850M	900M	1.8G	1.9G	AWS	2.1G
Typical power consumption(W)	265	265	275	280	285	285
Maximum power consumption(W)	455	455	485	495	505	505

5.5 Transmission

R8882 is connected to BBU through CPRI interfaces (for more information about CPRI interfaces, please refer to 0).

Table 5-5 CPRI Interface

Item	Value	Interface Kind	Speed	Standard
CPRI interface	2	SFP (LC)	2.4576 Gbps (MIMO 2*2)/ 4.9152Gbps(6.144Gbps) (MIMO 4*2)	CPRI V4.1

5.6 Working Environment

Table 5-6 ZXSDR R8882 Environment Condition Compatibility

Item	Characteristics
Temperature	-40 to +55 °C
Relative Humidity	5% to 100%
Waterproof/Dustproof	IP65
Ground	≤5 Ω; earth resistance can be less than 10 Ω in thunder-less area where thunderstorm days is less than 20 per year.
Storage	Indoor pack deposited
	Temperature: -40 °C to 70 °C
	Relative Humidity: 5% to 98%

5.7 Electromagnetic Compatibility

Table 5-7 R8882 EMC

Item	Characteristics
Static Discharge Immunity	Contact Discharge: ±6000V Air Discharge: ±8000V
Surge Impact Immunity	DC Power port Line(Ground): ±2000V

5.8 Reliability

In R8882, the algorithm of system reliability conforms to the national military GJB/Z299B Electronic Equipment Reliability Estimation Manual and US military handbook MIL-HDBK-217F Electronic Equipment Reliability Estimation.

Table 5-8 ZXSDR R8882 Reliability Characteristics

Item	R8882 (2x40W)	R8882 (2x60W)

Item	R8882 (2x40W)	R8882 (2x60W)
MTBF	≥316000 hours	≥322,000 hours
MTTR	1 hour	1 hour
Availability index	99.999684%	≥99.999689%
Down duration	1.66min	≤1.632 min/year

6 Operation and Maintenance

The operation and management of R8882 is performed by NetNumen U31 via BBU connected with it.

The functions include performance management, fault management, configuration Management, testing &diagnosing, etc.

7 Installation

ZXSDR R8882 is easy to deploy.

- It is portable to transport and flexible to install on the pole, tower and wall;
- Only fiber, power cable, RF cable antenna, PE and AISG cable need to be connected;
- Suitable for any weather condition with water resistance and dust proof case.

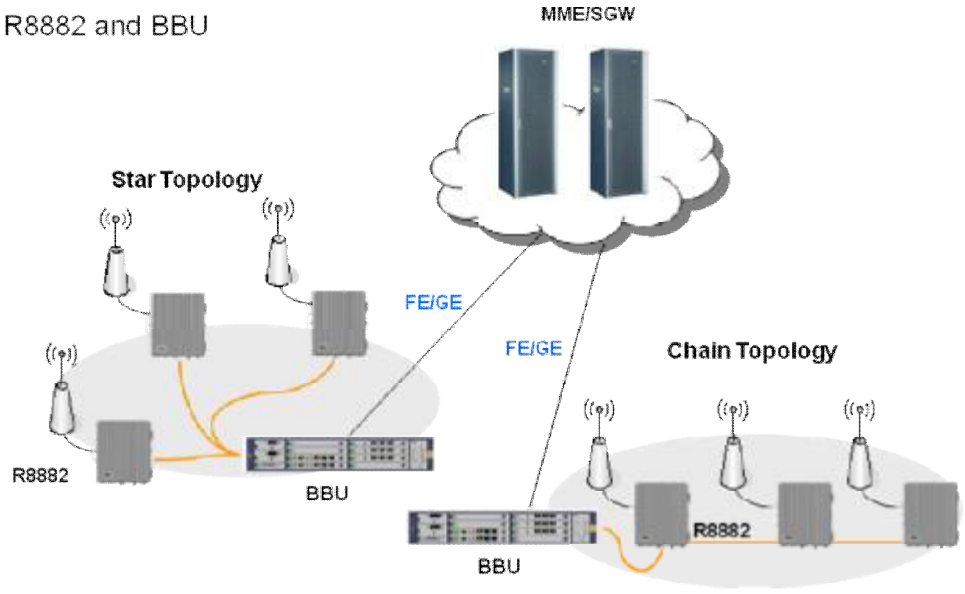
8 Networking

R8882 operates with baseband unit, constructing a complete distributed coverage solution.

R8882 connects to BBU via fiber through the standard CPRI interfaces. R8882 supports star, and chain networking with BBU.

When chain configuration is enabled, the CPRI1 in every RRU will be configured as uplink port.

Figure 8-1 R8882 Networking with BBU



9 Configuration Instructions

R8882 mentioned in this document is used for LTE single mode network. The hardware of ZXSDR R8882 can support maximum 40M frequency range, The maximum RF power output in LTE single-mode will be:

Table 9-1 R8882 Configuration Mode

RRU Type	Configuration	Capacity
R8882 (2x40W)	LTE single-mode	2x40W@20MHz, 700M and DD. 2x40W@2x20MH, 2.6G
R8882 (2x60W)	LTE single-mode	2x60W@ (20MHz+5MHz), 850M. 2x60W@ (20MHz+10MHz), 900M, 1900M.2x60W@2x20MHz, other band 30MHz)

10 Glossary

Abbreviations	Full Characteristics
3GPP	3rd Generation Partnership Project
BBU	Base Band processing Unit
BITS	Building Integrated Timing Supply
BP	Base Processing
BSP	Board Support Package
CAPEX	Capital Expenditure
CC	Control & Clock module
CPRI	Common Public Radio Interface
DIF	Digital Intermediate Frequency
DL	Downlink
DPD	Digital PreDistortion
DTX	Discontinuous transmission
EUTRAN	Evolved Universal Mobile Telecommunications System
FM	Fan Module
FE	Fast Ethernet
FS	Fabric Switch board
GPS	Global Positioning System
GSM	Global System for Mobile communications
HSPA+	HSPA Evolution
IBW	Instantaneous BandWidth
LMT	Local Maintenance Terminal
LTE	Long Term Evolution
MicroTCA	Micro Telecommunications Computing Architecture
MIMO	Multi Input Multi Output
MTBF	Mean Time Between Failures
MTTR	Mean Time To Recovery
OAM	Operating And Maintenance
OFDMA	Orthogonal Frequency Division Multiple Access
OPEX	Operation Expenditure

Abbreviations	Full Characteristics
OSS	Operation Support Sub-system
PM	Power Module
PS	Packet Switch
RF	Radio Frequency
RRU	Remote Radio Unit
SA	Site Alarm Board
SC-FDMA	Single Carrier Frequency Division Multiple Access
SCS	System Control Sub-system
SDR	Software Defined Radio
SE	Site Alarm Extension board
TA	Timing Advance
ToC	Top of Cabinet
UE	User Equipment
UL	Uplink
UTRAN	UMTS Terrestrial Radio Access Network
WCDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Interoperability for Microwave Access