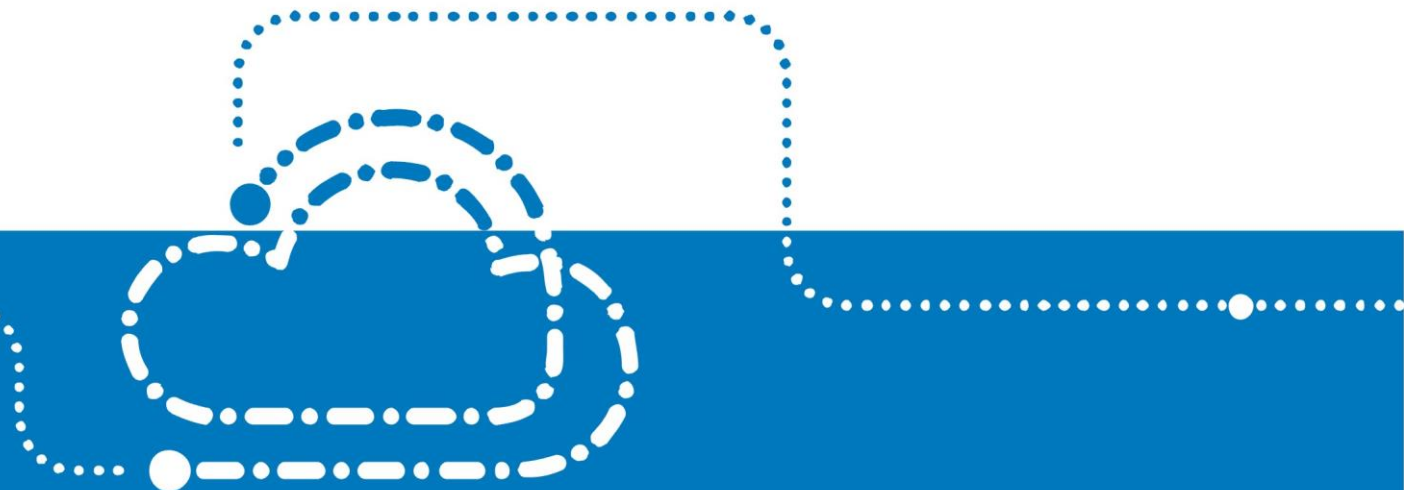# ZXSDR R8872A Product Description

UniRAN 16/GUL Multi-Mode

ZXSDR R8872A Product Description

Version	Date	Author	Reviewer	Notes
V1.00	2017/01/26	Yang Lisha		1. Update static receiver sensitivity 2. Update Reliability 3. Update power consumption 4. Update 256QAM in downlink
V1.10	2017/03/16	Yu Yang		1. Update capacity 2. Update bandwidth

TABLE OF CONTENTS

FIGURES

TABLES

1 Overview

1.1 Introduction

This document provides a high level description of ZTE ZXSDR R8872A (hereinafter referred to as R8872A), which is the latest compact RRU (Remote Radio Unit) used in ZTE wireless communication solution. Based on ZTE common innovative SDR platform, R8872A can work in GSM, UMTS, or LTE single mode or multi-mode at the same frequency band. The volume of R8872A is 20L, and its weight is 23Kg.

The document is designed to give an overview of the characteristics of R8872A, its key benefits, the architecture, functionality and services. The document also describes the system capabilities.

1.2 Benefits

- **High performance**

  R8872A has 2*80W of high TOC output power. With high output power, it supports large capacity which can be used in large site in dense urban with high traffic.

  R8872A is designed with wide bandwidth to meet with the growing demands for wide working bandwidth. E.g., R8872A supports 75MHz of IBW (instantaneous bandwidth) in band3 1800MHz frequency band. RRUs with full working bandwidth integrate more spectrum resources and help to decrease hardware investment exponentially.

- **SDR 2T4R design to ensure one clear and simple network**

  R8872A supports GSM, UMTS, LTE or mixed technologies. Design of 2T4R channels ensures the smooth evolution of the system from GSM/UMTS to LTE 2*2 MIMO. Instead of running hardware on independent platforms for each technology, operators can implement various wireless technologies through software configuration on the same hardware platform. It fully satisfies operators'

requirements of hybrid network deployment and long term evolution with lowest cost.

- **Lower Total Cost of Ownership (TCO)**

ZXSDR R8872A's PA adopts advanced efficiency enhancement technologies to realize high power efficiency, such as Doherty PA, DPD linear technology and MCPA technology. It also supports dynamic adaptive PA power supply due to the output power. Power consumption can be greatly decreased together with these features.

1.3   Application Scenarios

R8872A as the Remote Radio Unit and Baseband Unit (BBU) comprise distributed macro base station BS8700. It can be used in dense urban area with high traffic. Typical application scenarios of R8872A are shown in the following figure:

Figure 1-1   Application Scenarios

2   Product Architectures

2.1   Physical Appearance

The physical appearances of R8872A are shown in the following figure.

Figure 2-1   Physical Appearance
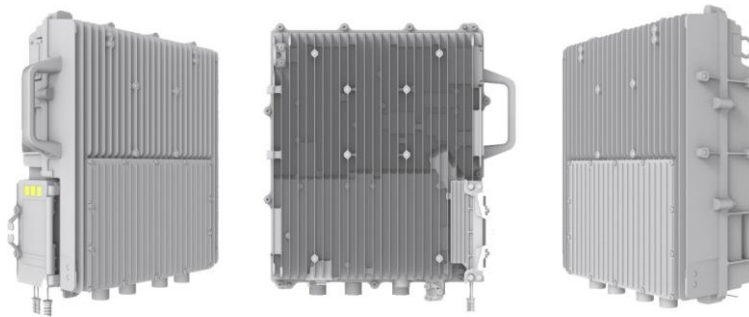
2.2   Hardware Architecture

The hardware architecture of R8872A is shown in Figure 2-2.

Figure 2-2   System Structure
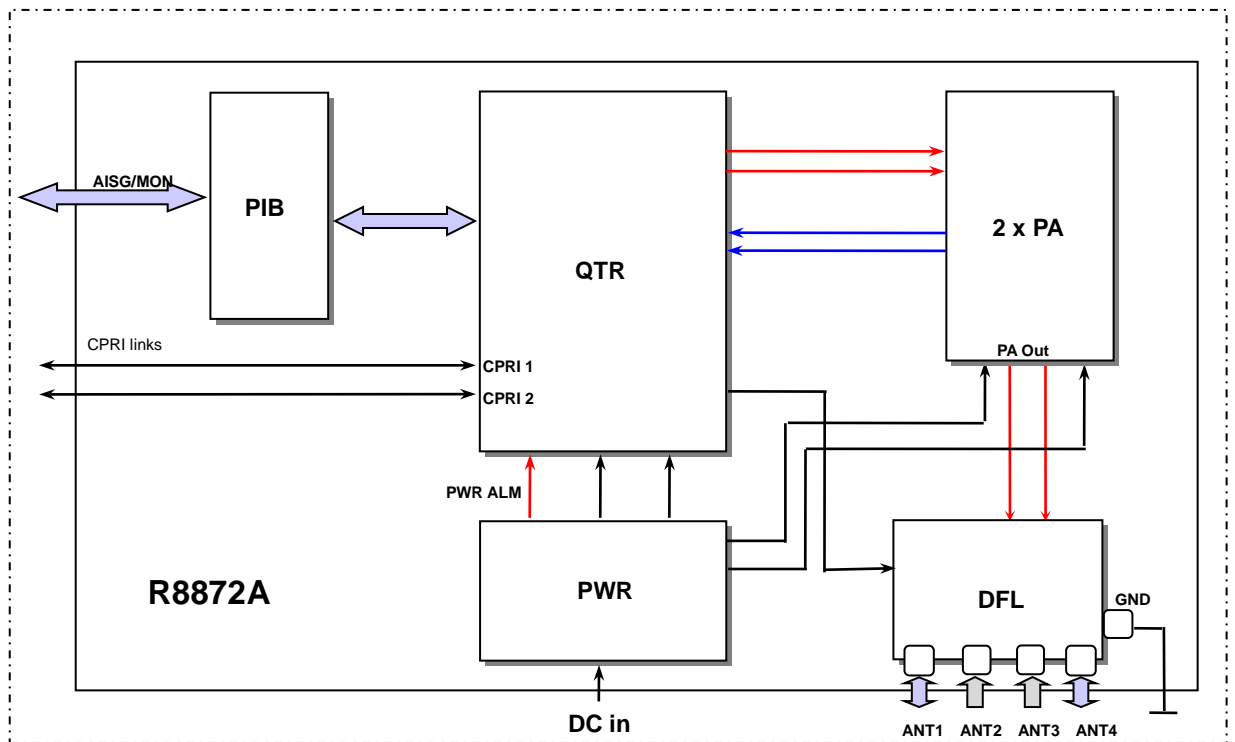
R8872A includes 5 main hardware modules:

- Quad-channel Transceiver (QTR)

- Duplex Filters LNA (DFL)

- 2x Power Amplifier (PA)

- Power module (PWR)

- Protecting Interface Board (PIB)

2.2.1   QTR

The QTR has following functions:

- Process 4 received signals and 2 transmitted signals;

- Convert uplink and downlink radio signal;

- Multiplex downlink IQ signal and de-multiplex uplink signal;

- Amplify, filter and convert A/D and D/A signal;

- Convert between optical and electric signal;

- Capture reference clock signal from baseband unit and provide clock signal to other units;

- Measure and report voltage standing wave ratio (VSWR);

- Self-detect and report hardware failure alarm;

- Detect and report over-heat alarm;

- Provide communication interfaces, including,

  - Two CPRI interfaces

  - one DB15 port, for 2 dry contacts, one local debugging or AISG connection through different kind of cables

- Reset function.

2.2.2 DFL

The DFL has following functions:

- Combine and isolate transmitted and received signals;

- Filter the transmitted signal and received signal;

- Provide DFL alarm monitor function.

2.2.3 PA

The PA has following functions:

- Perform radio signal amplifying function;

- Implement temperature report function;

- Implement Low-Noise-Amplifier (LNA) function;

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

2.2.4 PWR

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 QTR board.

2.2.5 PIB

The PIB has the following function:

- Integrate lightning protection unit for DB15 interface, and the protection level is 20 KA.

2.3 Software Architecture

The software architecture of R8872A can be divided into two layers, SDR Unified Platform Software and Application Software. The architecture is shown in the following figure:

Figure 2-3   R8872A Software Architecture
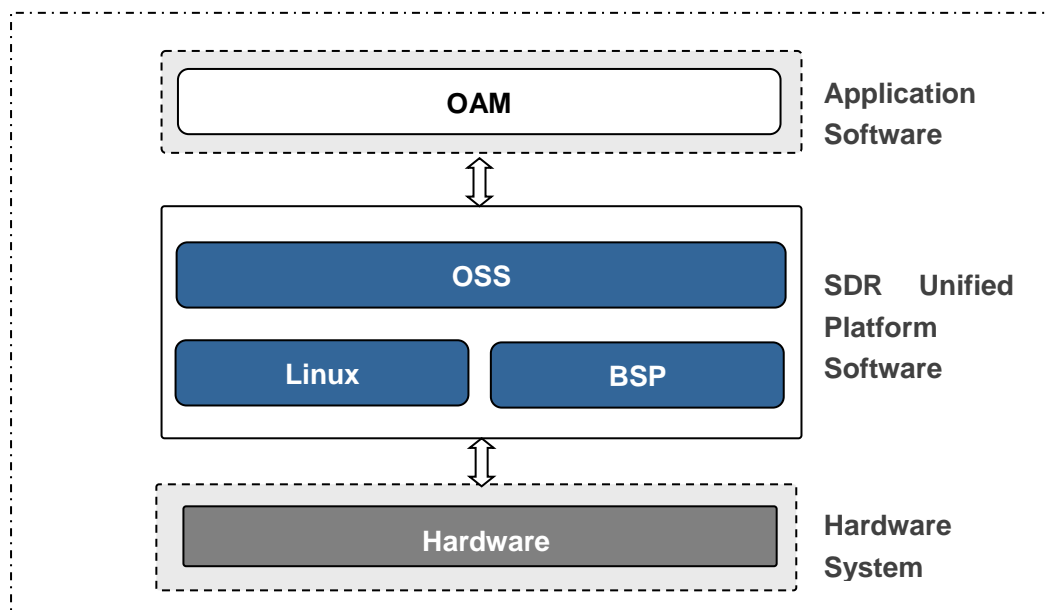
The Operating and Maintenance (OAM) sub-system is the application layer. Its main functions are software downloading, configuration, management, system maintenance and measurement.

The Operation Support Sub-system (OSS) is the supporting layer in this entire framework. It is a hardware independent layer that provides basic functions such as scheduling, timer, and memory management, communication, sequencing control, monitoring, alarming and logging.

The Board Support Package (BSP) provides device driver & initialization and supports basic functions like alarming and monitoring. It also provides the related interfaces and services to the Operating System.

2.4   Functionality

R8872A is the remote radio unit of distributed base station. The signal is transmitted/ received through R8872A 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 R8872A include:

- Support LTE bandwidth defined in 3GPP

- Support 850/900/1800/1900 MHz frequency band

- Support 2T4R in one box which can optimize spectrum efficiency greatly and improve network uplink performance

- Support 256QAM modulation in LTE downlink and 64QAM in uplink

- Support transmit power report function for every carrier

- Support overload protection function for power amplifier

- Support transmit channel switching on/off function.

3 Technical Specifications

3.1 Physical Indices

R8872A is the multi-carrier RRU with two transmitters. The physical appearance is shown below.

Figure 3-1 Physical Appearance
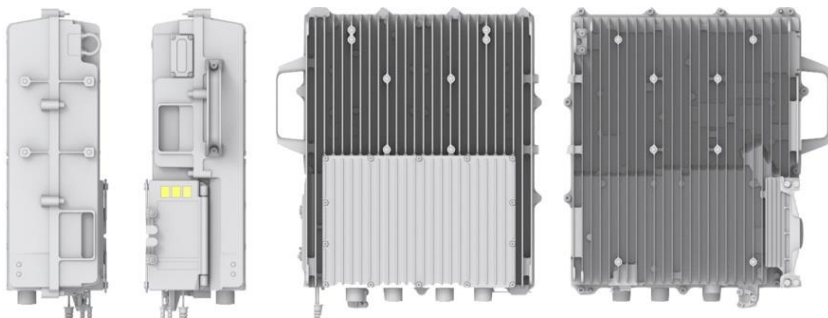
Table 3-1   Physical Indices

Item	Indices
Size (H*W*D) (mm)	415*352*137 mm (20L)
Weight (kg)	23 kg
Color	Silver gray

3.2   Performance Indices

3.2.1   Operation Frequency Band

Table 3-2   Operation Frequency Band

RRU Type	Band	Operation Radio Frequency Band	Mode
R8872A S8500	B5, 850 MHz	Tx: 869 – 894 MHz Rx: 824 – 849 MHz	GUL multi-mode
R8872A S9000	B8, 900 MHz	Tx: 934 – 960 MHz Rx: 889 – 915 MHz	GL dual-mode
R8872A S1800	B3, 1800 MHz	TX: 1805 – 1880 MHz RX: 1710 – 1785 MHz	GL dual-mode
R8872A S1900	B2, 1900 MHz	Tx: 1930 – 1990 MHz Rx: 1850 – 1910 MHz	GUL multi-mode

3.2.2   Capacity

Table 3-3   Capacity

RRU Type	System	RRU Capacity
R8872A S8500 R8872A S1900	GSM single mode	2*4 TRXs
	UMTS single mode	2*2 CSs
	LTE single mode	L 2*20M 2T2R Cells L 1*20M 2T2R Cell + L 1*15M 2T2R Cell
	GUL multi-mode	G 2*2TRXs + U 2*1CSs + L 1*10M 2T2R Cell
R8872A S9000	GSM single mode	2*6 TRXs
	LTE single mode	2*10MHz 2T2R/2T4R Cells
	GL dual-mode	G 2*4TRXs+L 1*10MHz 2T2R/2T4R Cell, or G 2*2TRXs+L 2*10MHz 2T2R/2T4R Cells
R8872A S1800	GSM single mode	2*6 TRXs
	LTE single mode	2*20MHz 2T2R/2T4R Cells
	GL dual-mode	G 2*4TRXs+L 1*20MHz 2T2R/2T4R Cell, or G 2*2TRXs+L 2*20MHz 2T2R/2T4R Cells

3.2.3   ToC Output Power

Table 3-4   ToC Output Power

RRU Type	TOC Output Power[1]
R8872A	2*80W

Note: When "ZGO-04-01-011 Power Boost for 8PSK" is applied in GSM mode, the TOC output power achieves the same in 8PSK modulation as in GMSK.

3.2.4   Bandwidth

R8872A supports all LTE bandwidth defined in 3GPP 15/20 MHz.

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[1] The TOC here means the max capability of the hardware. The specific TOC output power is limited by the license.

3.2.5 Receiver Sensitivity

The receiver sensitivity of R8872A is shown as following table.

Table 3-5   Static Receiver Sensitivity

Mode	Frequency Spectrum (MHz)	Single Antenna (dBm)	Dual Antennas (dBm)	Four Antennas (dBm)
GSM	850/900/1800/1900	-113.5	-116	-
UMTS	850/1900	-126.4	-129.1	-
LTE	900/1800	-106.4	-109.2	-112
	850/1900	-106.4	-109.2	N/A

3.3   Power Indices

3.3.1   Power Requirements

The following table describes the power supply and the fluctuation range.

Table 3-6   Power Supply

Item	Index
Power Supply	DC: -48 V (-37 V – -60 V DC)

R8872A supports integrated lightning protection module for DC power supply. Its protection level is 20 KA.

3.3.2   Power Consumption

Power consumptions of R8872A at normal ambient temperature are shown in the table below:

Table 3-7 Power Consumption

RRU Type	Configuration	Typical Power Consumption	Peak Power Consumption
R8872A S1800	GSM S8*20W	275W	555W
	GSM S2*2*20W+LTE 2*40W	335W	555W
R8872A S9000	GSM S8*20W	295W	575W
	LTE S2, 2*40W/LTE cell	315W	575W
	GSM S2*2*20W+LTE 2*40W	355W	575W
R8872A S8500	LTE 2*80W	315W	600W
R8872A S1900	LTE 2*80W	290W	550W

3.4 Interface Indices

The external interfaces of the R8872A are located at the bottom and on the front side of the chassis.

Figure 3-2 shows the external interfaces at the bottom of the R8872A chassis.

Figure 3-2 External Interfaces at the Bottom
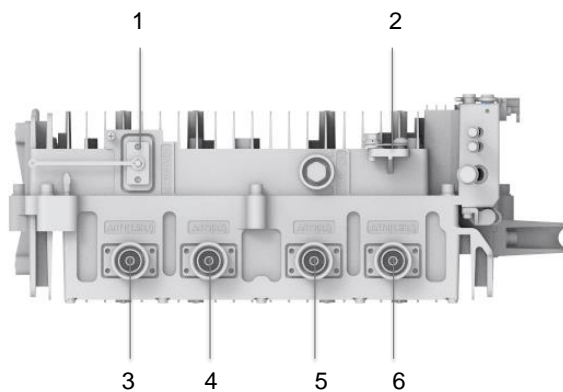
For a description of the external interfaces at the bottom of the R8872A chassis, refer to the following table.

Table 3-8   Description of the External Interfaces at the Bottom
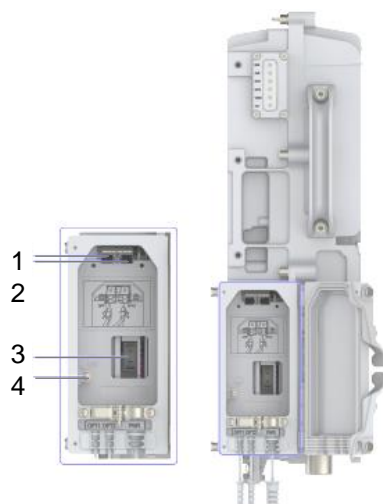
No.	Label	Interface	Interface Type/Connector
1	AISG/MON	AISG equipment interface MON external monitoring interface LMT O&M Ethernet interface	DB15 connector
2	GND	Protective grounding interface	16 mm^2 yellow-green round terminal
3	ANT1 (TX/RX)	TX/RX antenna interface	50 Ω DIN-mode connector
4	ANT2 (RX)	RX antenna interface	50 Ω DIN-mode connector
5	ANT3 (RX)	RX antenna interface	50 Ω DIN-mode connector
6	ANT4 (TX/RX)	TX/RX antenna interface	50 Ω DIN-mode connector

Figure 3-3 shows the external interfaces on the right side of the R8872A chassis.

Figure 3-3   External Interfaces on the Right Side

For a description of the external interfaces on the right side of the R8872A chassis, refer to the following table.

Table 3-9   Description of the External Interfaces on the Right Side

No.	Label	Interface	Interface Type/Connector
1	OPT1	Interface for communication between the RRU and a BBU, or RRU cascading interface	LC-type optical interface (IEC 874)
2	OPT2	RRU cascading interface	LC-type optical interface (IEC 874)
3	PWR	Power input interface	2-pin customized connector
4	⏚	Grounding cable interface for AC power supply	-

Additionally, R8872A provides 6 LED indicators. The indicators on the R8872A panel indicate the operating status of the RRU. The indicators are located on the front side of the chassis, see Figure 3-4.

Figure 3-4   LED Indicators on the Panel

3.5   Transmission

R8872A is connected to BBU through CPRI interfaces.

For more information about CPRI interfaces, refer to the following table.

Table 3-10   CPRI Interfaces

Item	Value	Interface Type	Speed	Standard
CPRI interface	2	SFP (LC)	6.144 Gbps [2]	CPRI V4.2

3.6   Working Environment Indices

Table 3-11   Environment Indices

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.

3.7   Electromagnetic Compatibility Indices

Table 3-12   Electromagnetic Compatibility Indices

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

3.8   Reliability Indices

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[2] The speed here refers to the max capability of the hardware. The specific speed depends on the optical module configuration.

Table 3-13   Reliability Characteristics

Item	R8872A
MTBF	DC: ≥458,000 hours
MTTR	1 hour
Availability index	DC: ≥99.999782%
Down duration	DC: ≤1.148 min/year

4 Glossary

Abbreviations	Full Name
BBU	Base Band processing Unit
BSP	Board Support Package
CPRI	Common Public Radio Interface
DL	Downlink
DFL	Duplexer & Filters
DPD	Digital Pre-Distortion
GSM	Global System for Mobile communications
LMT	Local Maintenance Terminal
LNA	Low-Noise-Amplifier
LTE	Long Term Evolution
MCPA	Multi-Carrier Power Amplifier
MIMO	Multi Input Multi Output
MTBF	Mean Time Between Failures
MTTR	Mean Time To Recovery
OAM	Operating And Maintenance
OSS	Operation Support Sub-system
PA	Power Amplifier
PWR	Power
QTR	Quad-channel Transceiver
RF	Radio Frequency
RRU	Remote Radio Unit
SDR	Software Defined Radio
ToC	Top of Cabinet
UE	User Equipment
UL	Uplink
VSWR	Voltage Standing Wave Ratio