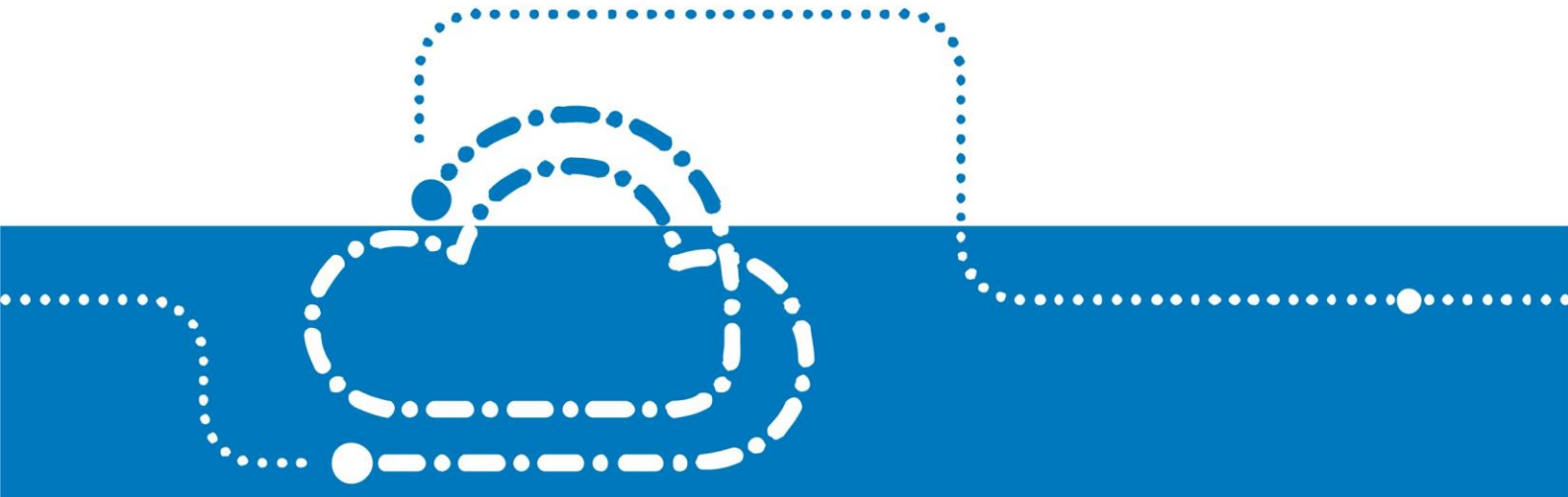
Operator Logo

ZXSDR R8862A Product Description

UniRAN 16/GUL Multi-mode



ZXSDR R8862A Product Description

Version	Date	Author	Reviewer	Notes
V1.0	2017/01/20	Yu Yang		1. Update capacity 2. Update receiver sensitivity 3. Update power consumption 4. Update CPRI interface
V1.1	2017/03/07	Yu Yang		1. Add 710MHz & 700MHz technical specifications

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1 Overview

1.1 Introduction

This document provides a high level description of ZTE ZXSDR R8862A (hereinafter R8862A), which is one new compact distributed RRU (Remote Radio Unit) used in ZTE wireless total solution. The RRU is based on common ZTE compacted RRU platform, and can work in GSM, CDMA, UMTS or LTE single mode or Multi-Mode at the same frequency band.

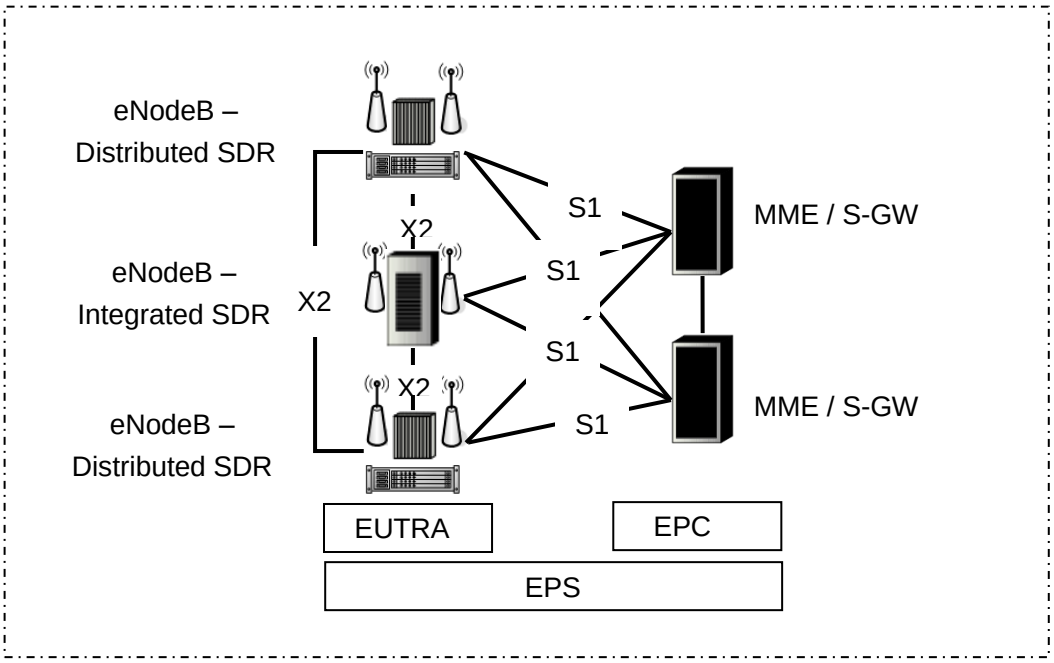
The document is designed to give an overview of the characteristics of R8862A, the key benefits, architecture, functionality and services. The document also describes the system capabilities.

1.2 LTE Network Architecture

LTE is a market driven technology, which offers higher data rate (150Mbps downlink and 75Mbps uplink for each cell @ 20MHz, MIMO 2*2) with low latency and short setup 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 technologies like 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 including Orthogonal Frequency Division Multiple Access (OFDMA) and Multiple-Input and Multiple-Output (MIMO) data transmission. Furthermore, the LTE PHY deploys the OFDMA for the downlink and Single Carrier Frequency Division Multiple Access (SC-FDMA) 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

- 2*4 MIMO Capability, Better Performance

  R8862A is based on new compacted RRU platform and high efficiency Power Amplifier technology. With two transmitting channels and four receiving channels, it supports 2*4 MIMO to improve coverage, data throughput and peak download speed.

- Faster deployment

R8862A is 12L in volume and 15Kg in weight. It is portable to transport and flexible to install on the pole, tower and wall, thus reducing OPEX.

- Higher Efficiency, Lower TCO

  R8862A's PA efficiency can reach up to 45% (The PA efficiency is different based on different working frequency bands);

  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.

- Integrated lightning protection unit

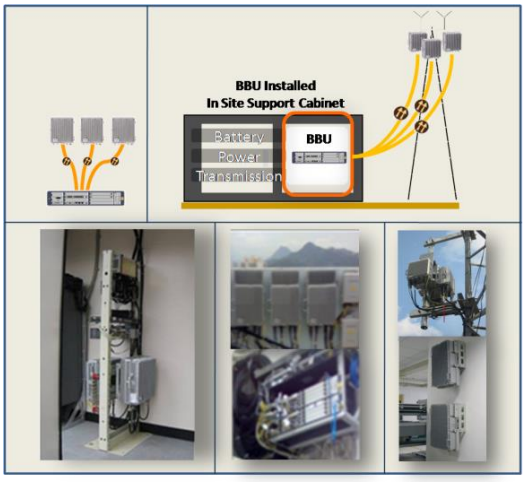
  R8862A supports integrated Lightning protection unit (PIB), and the protection level is 20 KA.

1.4 Application Scenarios

R8862A as the Remote Radio Unit (RRU) 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 Product Architecture

2.1 Physical Appearance

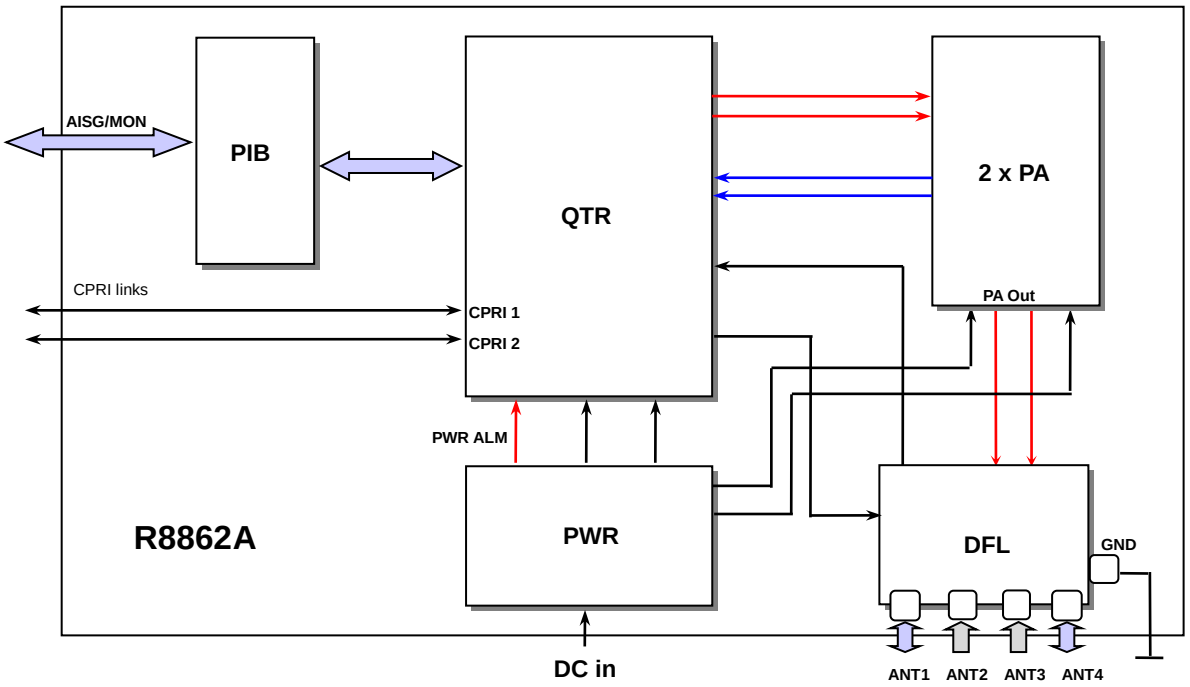
The physical appearances of R8862A are shown in the following figure.

Figure 2-1 R8862A Appearance

2.2 Hardware Architecture

The hardware architecture of R8862A is shown in Figure 2-2.

Figure 2-2 R8862A System Structure



Notes: QTR means Quad-channel Transceiver used for 2T4R.

R8862A 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;
- 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;
- Voltage Standing Wave Ratio (VSWR) measurement and report;
- Hardware failure self-detection and alarm;
- Over-heat detection and alarm;
- Provide communication interfaces, 2 CPRI interfaces, One DB15 port, for dry contact, 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;
- Temperature report function;
- Low-Noise-Amplifier (LNA) function;
- 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

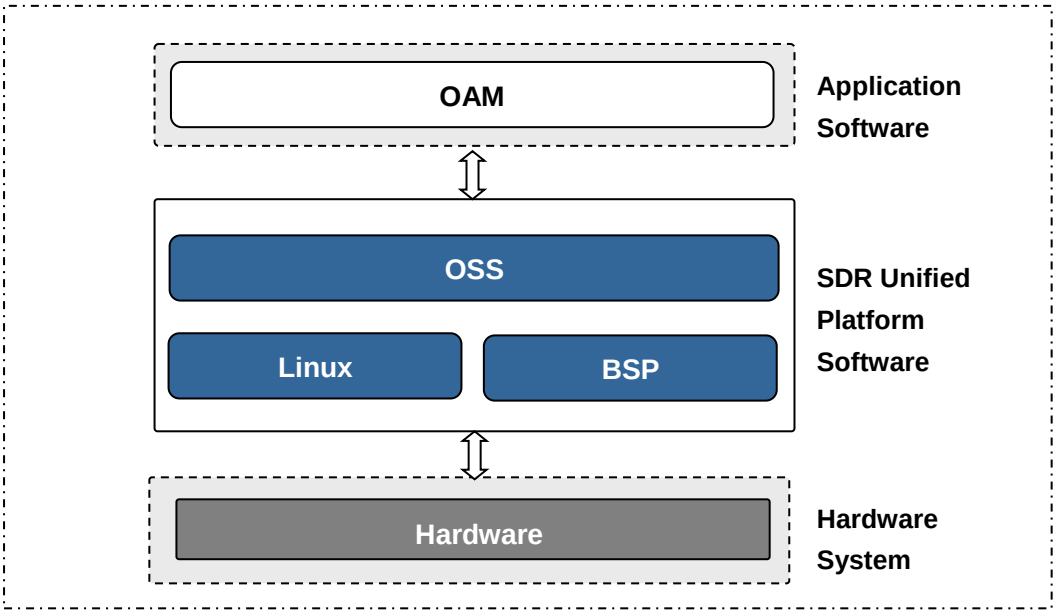
The PIB has the following function:

- Integrated lightning protect unit for the AISG and dry contacts, and the protection level is 20 KA.

2.3 Software Architecture

The software architecture of R8862A can be divided into two layers: SDR Unified Platform Software and Application Software. The architecture is shown in the following figure:

Figure 2-3 R8862A 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

R8862A is the remote radio unit of distributed base station. The signal is transmitted /received through R8862A 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 R8862A include:

- Support the LTE configuration of 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz scalable bandwidth defined in 3GPP
- Supports the UMTS configuration of 5MHz/4.8MHz/4.6MHz/4.4MHz/4.2MHz channel interval of each carrier
- Band Supported: AP700/710/700/850/900/AWS/1800/2100/2600 MHz
- Support 2T4R(S8500/S1700/S1800/S2100/S2600) in one box which can optimize spectrum efficiency greatly and improve network uplink performance
- Support 64QAM modulation in both LTE 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
- R8862A software failure will not affect the running of BBU and other R8862As which are connected to it.

3 Technical Specifications

3.1 Physical Indices

R8862A is one new compacted RRU. For band 1/3/5/7/8, the dimension is 12L and the weight (without sunshield) 15 kg. For band 28/13/12+17, due to increased depth of duplexer, the size is a little bigger than the others.

Figure 3-1 R8862A Physical Appearance Type I (850/900/1700/1800/2100/2600 MHz)

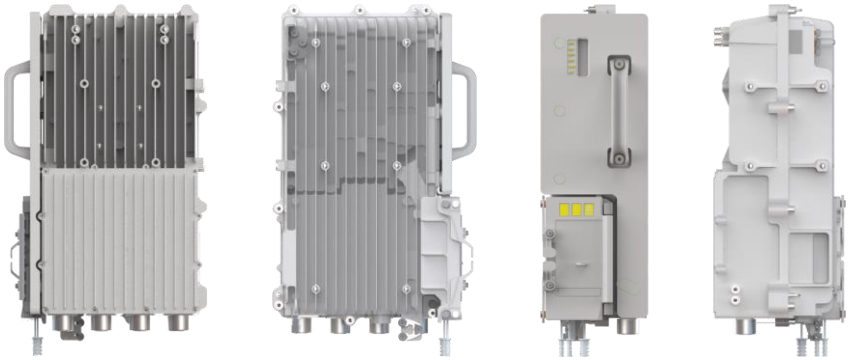


Figure 3-2 R8862A Physical Appearance Type II (AP700/710/700 MHz)

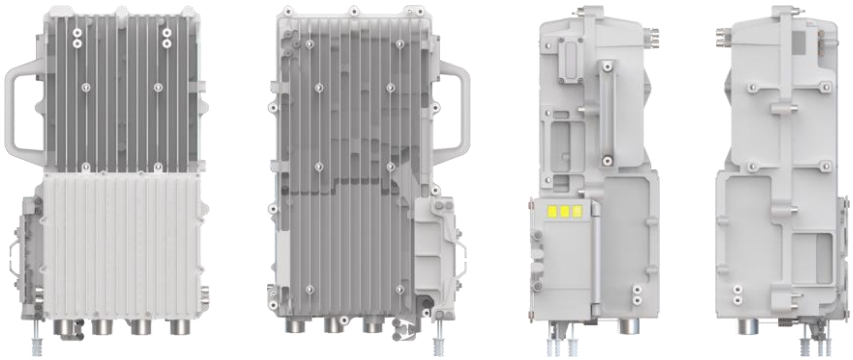


Table 3-1 Physical Indices

Module	Dimension
R8862A S8500/S9000/S1700/S1800/S2100/S2600/S2601	Size (H*W*D): 422 * 218 * 133 mm^3, 12L Weight: 15 kg Color: Silver gray
R8862A S7200/S7000/S7100	Size (H*W*D): 422 * 218 * 165 mm^3, 15L Weight: 17 kg Color: Silver gray

3.2 Performance Indices

3.2.1 Operation Frequency Band

Table 3-2 Operation Frequency Band

Module	Band	Operation Radio Frequency Band	Mode
R8862A S7200	B28, AP700 MHz	Tx: 758 – 803 MHz Rx: 703 – 748 MHz	LTE
R8862A S7100	B13 710 MHz	Tx: 746 MHz–756 MHz Rx: 777 MHz–787 MHz	LTE
R8862A S7000	B12+B17 700 MHz	Tx: 728 MHz–746 MHz Rx: 698 MHz–716 MHz	LTE
R8862A S8500	B5, 850 MHz	Tx: 859– 894 MHz Rx: 814 – 849 MHz	UMTS/LTE
R8862A S9000	B8, 900 MHz	**Type1:** Tx: 925 – 960 MHz Rx: 880 – 915 MHz **Type2:** Tx: 934 – 960 MHz Rx: 889 – 915 MHz	GSM/UMTS/LTE
R8862A S1700	B4, AWS	Tx: 2110 – 2155 MHz Rx: 1710 – 1755 MHz	UMTS/LTE
R8862A S1800	B3, 1800 MHz	**Type1:**	GSM/LTE

Module	Band	Operation Radio Frequency Band	Mode
		Tx: 1805 – 1860 MHz Rx: 1710 – 1765 MHz **Type2:** Tx: 1830 – 1880 MHz Rx: 1735 – 1785 MHz **Type3:** Tx: 1805 – 1880 MHz Rx: 1710 – 1785 MHz	
R8862A S2100	B1, 2100 MHz	Tx: 2110 - 2170 MHz Rx: 1920 - 1980 MHz	UMTS/LTE
R8862A S2600 R8862A S2601	B7, 2600 MHz	Tx: 2620 – 2690 MHz Rx: 2500 – 2570 MHz	LTE

3.2.2 Capacity

Table 3-3 Capacity

System	RRU Capacity
LTE single mode	2 LTE 20MHz 2T2R/2T4R cell
GSM single mode 900 MHz	8 GSM TRXs
GSM single mode 1800 MHz	12 GSM TRXs
GU dual-mode 900MHz	8 GSM TRXs + 4 UMTS carriers
GL dual-mode 900 MHz	8 GSM TRXs +1 LTE 10MHz 2T2R Cell
GL dual-mode 1800 MHz	8 GSM TRXs +1 LTE 20MHz 2T4R Cell or 4 GSM TRXs + 2 LTE 20MHz 2T4R Cell
UMTS single mode 2100 MHz	8 UMTS carriers (non-MIMO) 4 UMTS carriers (MIMO)
UL dual-mode 850MHz	4 UMTS carriers + 1 LTE 10MHz 2T2R/2T4R Cell
UL dual-mode 900MHz	4 UMTS carriers + 1 LTE 10MHz 2T2R Cell
UL dual-mode 1700MHz	4 UMTS carriers + 1 LTE 20MHz 2T2R/2T4R Cell

UL dual-mode 2100 MHz/AWS	2 UMTS carriers (MIMO) + 2 LTE 20MHz 2T2R Cell, or 4 UMTS carriers (non-MIMO) + 1 LTE 20MHz 2T2R Cell
GUL multi-mode 900MHz	4 GSM TRXs + 2 UMTS carriers + 1 LTE 10MHz 2T2R Cell

3.2.3 ToC Output Power

Table 3-4 ToC Output Power

Type	PA Output Power	TOC Output Power [1]
R8862A S7200 (AP700)	2*75W	2*60W
R8862A S7100	2*55 W	2*40 W
R8862A S7000	2*55 W	2*40 W
R8862A S8500	2*75W	2*60W
R8862A S9000	2*75W	2*60W
R8862A S1700	2*75W	2*60W
R8862A S1800	2*75W	2*60W
R8862A S2100	2*75W	2*60W
R8862A S2600	2*50W	2*40W
R8862A S2601	2*75W	2*60W

3.2.4 Bandwidth

R8862A supports all LTE bandwidth defined in 3GPP:

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

3.2.5 Receiver Sensitivity

The receiver sensitivity of R8862A is shown as following table.

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

Table 3-5 R8862A Receiver Sensitivity

Mode	Frequency Spectrum(MHz)	Single Antenna (dBm)	Dual Antennas (dBm)	Four Antennas (dBm)
GSM	900/1800	-113.5	-116.1	N/A
UMTS	2100	-126.5	-129.2	N/A
	900	-126.4	-129.1	N/A
LTE	710/700/AP700/ 850/900	-106.6	-109.4	-112.2
	AWS/1800/2100/ 2600	-106.4	-109.2	-112

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) AC: 220 V / 110 V (100 V – 240 V AC)

R8862A supports integrated lightning protection module for DC power supply. Its protection level is 20 KA.

3.3.2 Power Consumption

Power consumption of R8862A in UL dual-mode and LTE single mode are shown in the table below.

Table 3-7 R8862A Power Consumption in LTE Single Mode

Configuration: LTE single carrier, 2PA, 60W/LTE

Module	Average PC (W)	Peak PC (W)
R8862A S7200	220	440
R8862A S8500	210	430
R8862A S9000	210	415
R8862A S1800	220	370
R8862A S2100	210	440
R8862A S2601	240	470

Table 3-8 R8862A Power Consumption in LTE Single Mode

Configuration: LTE single carrier, 2PA, 40W/LTE		
Module	**Average PC (W)**	**Peak PC (W)**
R8862A S7100	210	400
R8862A S7000	210	400
R8862A S2600	230	430

Table 3-9 R8862A Power Consumption in U/L Dual-mode

Configuration: 4U+1L 2*2 MIMO, 2PA, 20W/LTE, 20W/UMTS		
Module	**Average PC (W)**	**Peak PC (W)**
R8862A S2100	250	420

Table 3-10 R8862A Power Consumption in G/L Dual-mode

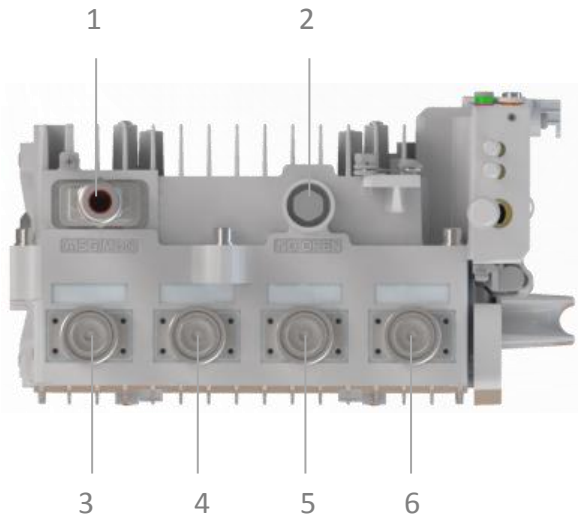
Configuration: 4G+1L 2*2 MIMO, 2PA, 20W/LTE, 20W/GSM		
Module	**Average PC (W)**	**Peak PC (W)**
R8862A S9000	290	415
R8862A S1800	245	370

3.4 Interface Indices

The external interfaces of the R8862A are located at the bottom and on the front side of the chassis.

Figure 3-3 shows the external interfaces at the bottom of the R8862A chassis.

Figure 3-3 External Interfaces at the Bottom



For a description of the external interfaces at the bottom of the R8862A chassis, refer to Table 3-11.

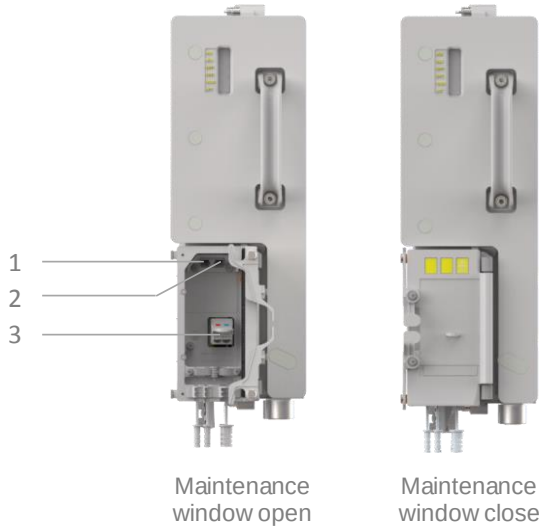
Table 3-11 Description of the External Interfaces at the Bottom

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 mm2 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

No.	Label	Interface	Interface Type/Connector
6	ANT4 (TX/RX)	TX/RX antenna interface	50 Ω DIN-mode connector

Figure 3-4 shows the external interfaces on the right side of the R8862A chassis.

Figure 3-4 External Interfaces on the Right Side



For a description of the external interfaces on the right side of the R8862A chassis, refer to Table 3-12.

Table 3-12 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

Additionally, R8862A provides 6 LED indicators. The indicators on the R8862A panel indicate the operating status of the RRU. The indicators are located on the front side of the chassis, see Figure 3-5.

Figure 3-5 LED Indicators on the Panel

3.5 Transmission

R8862A is connected to BBU through CPRI interfaces. For more information about CPRI interfaces, refer to the following table.

Table 3-13 CPRI Interfaces

Item	Value	Interface Type	Speed	Standard
CPRI interface	2	SFP (LC)	6Gbps [2]	CPRI V4.2

3.6 Working Environment Indices

Table 3-14 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

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

Item	Characteristics
	per year.

3.7 Electromagnetic Compatibility Indices

Table 3-15 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

Table 3-16 R8862A Reliability Characteristics

Item	R8862A
MTBF	DC: ≥464,000 hours AC: ≥442,000 hours
MTTR	1 hour
Availability index	DC: ≥99.999784% AC: ≥99.999774%
Down duration	DC: ≤1.133 min/year AC: ≤1.189 min/year

4 Glossary

Abbreviations	Full Name
3GPP	3rd Generation Partnership Project
BBU	Base Band processing Unit
BSP	Board Support Package
CAPEX	Capital Expenditure
CPRI	Common Public Radio Interface
DIF	Digital Intermediate Frequency
DL	Downlink
DFL	Duplexer & Filters
DPD	Digital Pre-Distortion
EUTRAN	Evolved Universal Mobile Telecommunications System
GSM	Global System for Mobile communications
HSPA+	HSPA Evolution
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
OFDMA	Orthogonal Frequency Division Multiple Access
OPEX	Operation Expenditure
OSS	Operation Support Sub-system
PA	Power Amplifier
PWR	Power
QTR	Quad-channel Transceiver
RF	Radio Frequency
RRU	Remote Radio Unit
SC-FDMA	Single Carrier Frequency Division Multiple Access

Abbreviations	Full Name
SDR	Software Defined Radio
ToC	Top of Cabinet
UE	User Equipment
UL	Uplink
UTRAN	UMTS Terrestrial Radio Access Network
VSWR	Voltage Standing Wave Ratio