ZXSDR R8882 Product Description

UR12

Section 13.2.1.2

ZXSDR R8882 Product Description

Version	Date	Author	Reviewer	Notes
V1.13	2013	ZTE		

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1 Overview

1.1 Introduction

With the multi-mode era coming, ZTE, who is dedicated to providing comprehensive network solutions and delivering the future-oriented quality network for the operators, developed the ground breaking SDR unified platform with the essential feature to support multi-mode and multi-band radio access.

Based on this innovative SDR platform, ZTE promotes a series of products to satisfy different scenario requirements, including the Indoor macro, outdoor macro, distributed, outdoor micro, mini and pico base station.

The SDR-based serial products aim to design a unified network which can bring seamless experience to operators. In GSM, UMTS, LTE or mixed mode, it enables operators to save CAPEX and OPEX significantly because they only need to deploy a Uni-Radio Access Network (RAN), compared to the costs involved with independent GSM and UMTS networks.

ZTE ZXSDR R8882 is one distributed Remote Radio Unit (RRU) used in ZTE Uni-RAN total solution, with two transmitters. The RRU is based on the common ZTE new generation RRU platform, and can work in GSM and UMTS single mode or multi-mode in the same frequency band.

1.2 Benefits

Software Defined Radio (SDR) is the evolution of base station technology. ZTE has made great effort and invested much in this new technology for many years. And then the R8882 RRU product and B8200 BBU product based on SDR technology were released.

ZTE's SDR Uni-RAN architecture supports GSM, UMTS, LTE and Uni-RAN simultaneously. Operators then can benefit a lot from ZTE's SDR platform. The following part lists the key benefits for operators.

- **High performance**

To meet the growing demands for wide working bandwidth, R8882 modules with full working bandwidth are released. Maximum working bandwidth of R8882 is 75MHz for 1800M band and 35MHz for 900M band. For frequency spectrums become scarce, resources allocated for operators tend to be characterized with fragmentation and large span. RRUs with full working bandwidth integrate more spectrum resources and help to decrease hardware investment exponentially.

- **Clearer and simpler network**

  R8882 supports GSM, UMTS, LTE or mixed technologies. Instead of running hardware on independent platforms for each technology, operators can implement various wireless technologies in software on the same hardware platform.

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

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

  ZXSDR R8882's PA adopts advanced efficiency enhancement technologies to realize high power efficiency, such as Doherty PA, DPD linear technology and MCPA technology. Power consumption can be greatly decreased together with these features.

  Passive thermal dissipation design also contributes to power saving and less noisy.

  The operation and maintenance of one single wireless network is much simpler than multiple system networks. Fewer engineers are required and less implementation to be taken for system interworking or upgrade.

1.3 Application Scenarios

ZXSDR R8882 is fully software defined. It supports GSM, UMTS, LTE single mode or dual-mode through software update only. It supports multi-mode at the same frequency band simultaneously. It fully satisfies operators' requirements of hybrid network deployment and long-term evolution at lower cost.

Figure 1-1 & Figure 1-1 shows that the network can be easily expanded from S11 to S44, or S111 to S444 with non-MIMO or 2*2 MIMO with least hardware changes.

Figure 1-1 ZXSDR R8882 2T4R Application Scenario

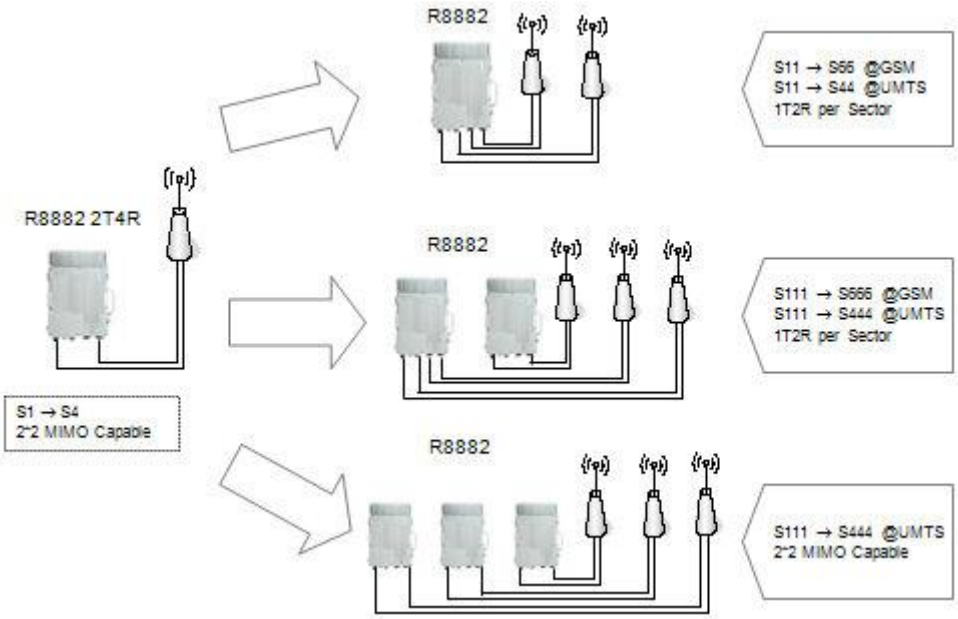
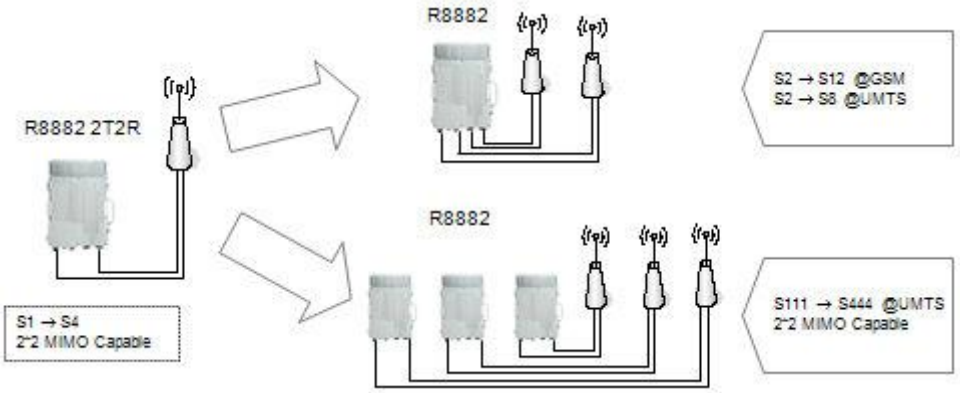


Figure 1-2 ZXSDR R8882 2T2R Application Scenario



2 Product Architecture

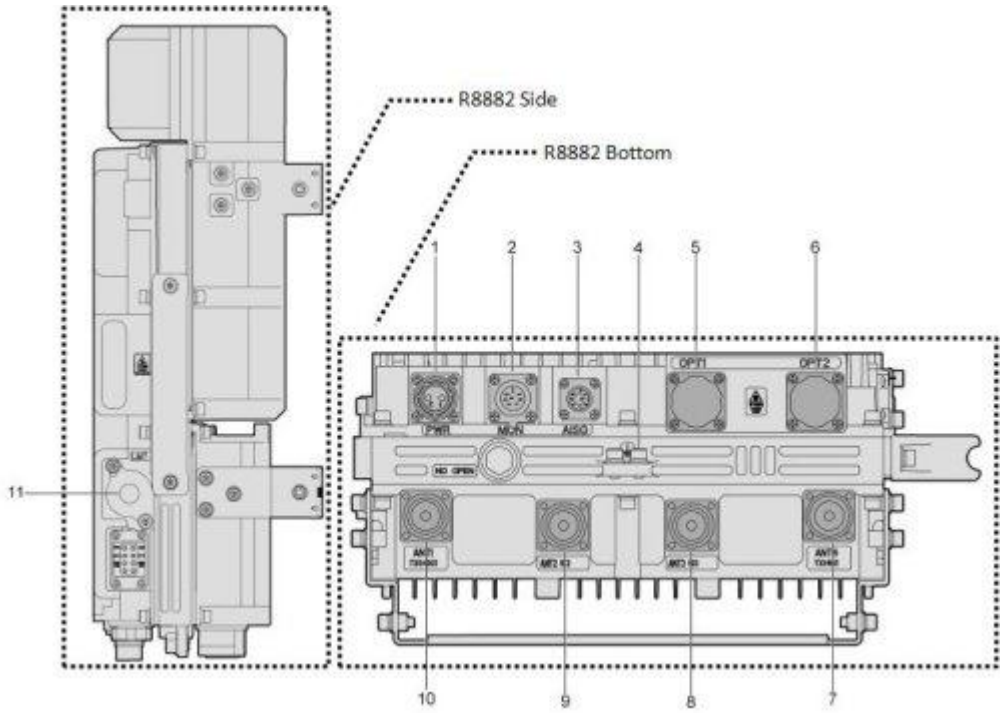
2.1 Physical Structure

R8882 is the multi-carrier RF module with two transmitters. It has two PAs, with both PAs working on 850M/900M/1800M/1900M/2100MHz/AWS. There are two types of R8882, 2T2R and 2T4R. The differences between 2T2R and 2T4R modules include working bandwidth and number of receivers. In the physical appearance, R8882 2T4R has four antenna feeder interfaces but R8882 2T2R only has two. Except this, there is no difference in the shell.

Figure 2-1 ZXSDR R8882 Physical Structure

R8882 external interfaces are located at the bottom of R8882 and LMT at its side, as shown in Figure 2-2.

Figure 2-2 ZXSDR R8882 External Interfaces



The interfaces are described in the following table.

Table 2-1 ZXSDR R8882 External Interfaces Description

S.N.	Label	Interface	Interface Type/Connector
1	PWR	-48V DC power input interface	2-pin round metal connector (male)
2	MON	External monitoring interface	8-pin straight panel mount round socket (male)
3	AISG	AISG interface	8-pin socket with a square base
4	GND	PE interface	16 mm^2 yellow-green round terminal
5	OPT1	BBU and RRU Interface/RRU cascading interface	LC type optical interface (IEC 874)
6	OPT2	BBU and RRU Interface/RRU cascading interface	LC type optical interface (IEC 874)

7	ANT4 (TX1/RX1)	Antenna feeder interface (Tx1/Rx1)	50 Ω DIN-mode connector
8	ANT3 (RX3) (Optional*)	Antenna feeder interface (Rx3)	50 Ω DIN-mode connector
9	ANT2 (RX2) (Optional*)	Antenna feeder interface (Rx2)	50 Ω DIN-mode connector
10	ANT1 (TX0/RX0)	Antenna feeder interface (Tx0/Rx0)	50 Ω DIN-mode connector
11	LMT	Ethernet interface for operation and maintenance	8P8C shielded right angle PCB mount jack with LED (left yellow, right green)

Optional*: For R8882 2T2R, ANT3 and ANT2 interfaces do not exist.

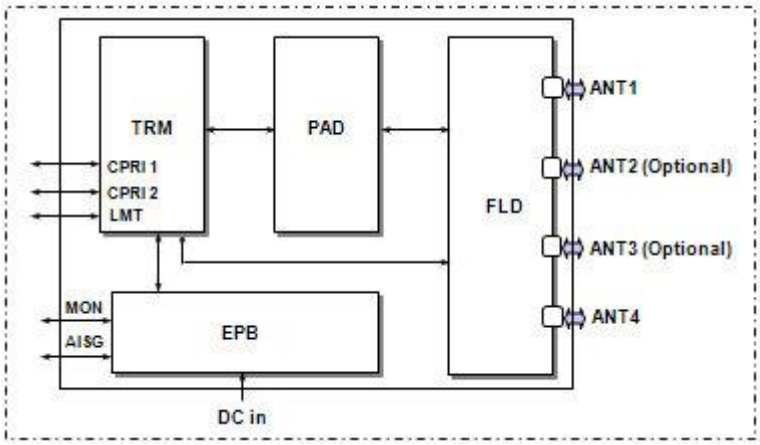
2.2 Hardware Structure

R8882 includes the following 4 main hardware modules:

- Transceiver for multi modes (TRM)
- Filter of dual duplexers (FLD)
- Power amplifier of dual channels (PAD)
- EMC protection board (EPB)

The hardware structure of R8882 is shown in Figure 2-3:

Figure 2-3 ZXSDR R8882 System Structure



Optional: For R8882 2T2R, ANT3 and ANT2 interfaces do not exist.

2.2.1 Transceiver for multi modes (TRM)

The TRM has following functions:

- Processes 4 (or 2) received signals and 2 transmitted signals
- Communicates with baseband unit and cascading RRU
- Captures reference clock signal from baseband unit
- Supports downlink/uplink IQ signal processing
- Supports radio frequency hopping function
- Supports adaptive modulation rate processing
- Provides indication light
- Supports hardware failure self-detection and alarm
- Provides communication interfaces, 2 CPRI interfaces
- Supports reset function

2.2.2 Filter of dual duplexers (FLD)

The FLD includes 2 duplexers and 4 (or 2) receiving filters and has the following functions:

- Transmits and receives uplink and downlink signals in duplex mode
- Suppresses spurious emission on the downlink to get acceptable out-band T spurious emission required by the system and related protocol
- Suppresses interference signals on the uplink to achieve a satisfied noise coefficient

2.2.3 Power amplifier of dual channels (PAD)

The PAD includes 2 PAs and 4 (or 2) LNAs and has following functions:

- Amplifies downlink radio signals received from the TRM, and outputs the amplified signals to the FLD
- Amplifies four signals received from the FLD with the LNA, and then sends the amplified signals to the TRM
- Provides a pre-distortion feedback interface to the TRM
- Provides an interface to the TRM for Voltage Standing Wave Ratio (VSWR) detection (forward power detection)
- Supports separate switch-off
- Supports Inner-module temperature detection
- Provides read and write interfaces for module inventory management

2.2.4 EMC protection board (EPB)

The EPB has following functions:

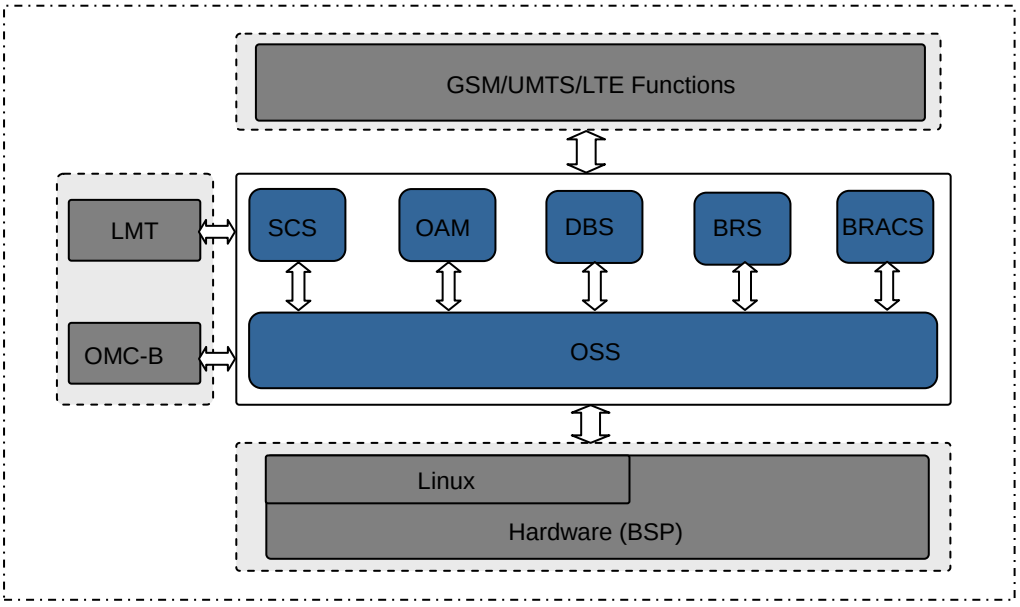
- Provides the built-in lightning protection for -48 V power supply

- Provides -48 V power filter
- Protects AISG signals (half-duplex 485 signal)
- Provides two pairs of dry contacts
- Protects the RS485 monitoring signals
- Provides adaptation for external MON interface, AISG interface, and power interface
- Provides the hardware version identifiers of boards

2.3 Software Architecture

The software system of R8882 can be divided into operating support layer and application layer.

Figure 2-4 SDR BTS Software Structure



The operating support layer provides the functions of OSS, while OAM, DBS, BRS, BRACS and SCS serve different BTS modes.

- OAM (Operating and Maintenance) is to provide the configuration, alarm and performance measurement function.
- DBS (Database Sub-system) is the database system.
- BRS (Bearer Sub-system) is for protocol stack processing.
- BRACS (Bearer Access Control Sub-system) is to control the access to bear layer.
- SCS (System Control Sub-system) is to control the power supplying and active/standby switching.

OSS (Operation Support Sub-system) is the support layer in this entire framework, which is a hardware platform for running software and provides basic functions like scheduling, timer, memory management, communication, sequencing control, monitoring, alarming and logging.

Board Support Package (BSP) is the software closely connected with the board hardware and supports Real Time Operation Support Sub-system (RT OSS) to work on the board.

2.4 Functionality

R8882 supports the following functionalities:

- Supports 850M/900M/1800M/1900M/2100MHz/AWS bands
- Supports 80W of output power
- supports two cells configuration with 2T4R module
- Supports 2*2 MIMO configuration
- Supports GSM only, UMTS only, LTE only or mixed mode module
- Supports maximally 35MHz working bandwidth in 900MHz, 75MHz in 1800MHz, and full working bandwidth in 850M/1900M/2100MHz/AWS bands

- Supports maximally 6 GSM TRXs in GSM single mode, 4 UMTS carriers in UMTS single mode or 20MHz for LTE in one PA
- Supports RTWP report interval at 100ms and 2ms
- Supports transmit power reporting function for every carrier
- Supports over loading protection function for power amplifier
- Supports measurement, compensation and adjustment function for channel delay
- Supports dynamic PA voltage adjustment to achieve best efficiency in different system loads
- Supports transmitting channel switching on/off function
- Supports built-in lightning protection function for DC power supply

3 Technical Specifications

3.1 Physical Indices

ZXSDR R8882 employs the compact design, whose physical indices are listed below.

Table 3-1 ZXSDR R8882 Physical Indices

Item	Index
Dimension (H*W*D)	480*320*150 mm (23L)
Weight	23 Kg
Color	Silver gray

3.2 Performance Indices

3.2.1 Operation Frequency Band

Table 3-2 ZXSDR R8882 Operation Frequency Band

Item	Index
Operation frequency band	GSM single mode: 850M/900M/1.8G/1.9GHz UMTS single mode: 850M/900M/1.9G/2.1GHz/AWS LTE single mode: 850M/900M/1.8G/1.9G/2.1GHz/AWS G/U dual-mode: 850M/900M/1.9GHz G/L dual-mode: 900M/1.8GHz U/L dual-mode: 900M/2.1GHz

* R8882 2T2R is for 1800MHz only, and R8882 2T4R for all bands mentioned above.

3.2.2 Capacity

Table 3-3 ZXSDR R8882 Capacity

Item	Index
Capacity	GSM: 12 TRXs, or 6 TRXs@900M + 6 TRXs@1800M UMTS: 8 Carriers LTE: 1.4M, 3M, 5M, 10M, 15M, 20MHz G/U 900M: 8 GSM TRXs + 2 UMTS Carriers or 4 GSM TRXs + 4 UMTS Carriers G/L 900M: 4 GSM TRXs + 20M LTE G/L 1.8G: 8 GSM TRXs + 20M LTE U/L dual-mode: 2 UMTS carriers + 20M LTE

3.2.3 Receiver Sensitivity

Receiver sensitivity of R8882 is shown as following table:

Table 3-4 ZXSDR R8882 Receiver Sensitivity

Item	Index
Receiver sensitivity	-113.5 dBm @ GSM single antenna
	-126.5 dBm @ UMTS single antenna
	-129.2 dBm @ UMTS dual antennas
	-106dBm @ LTE single antenna
	-108.6dBm @ LTE double antennas

3.2.4 TOC Output Power

Table 3-5 ZXSDR R8882 TOC Output Power

Item	Index
GSM	2*60W (GMSK) / 2*40W (8PSK)
UMTS/LTE single mode, or Dual-mode	2*60W

3.3 Power Indices

3.3.1 Power Supply

Table 3-6 ZXSDR R8882 Power supply indices

Modules	Input Power
R8882	DC: -48 V (-37 V~-60 V DC) AC: 110 V/220 V (90 V~290 V AC) (by AC/DC lightning protection unit)

3.3.2 Power Consumption

Table 3-7 ZXSDR R8882 Power Consumption in UMTS Single Mode

Items (S1/1, 2PA, TOC 2*20W)	Power Consumption (W)	
	Average	Peak

Items (S1/1, 2PA, TOC 2*20W)	Power Consumption (W)	
	Average	Peak
R8882 (900MHz)	185	240
R8882 (2.1GHz)	155	210
R8882 (850MHz)	145	195
R8882 (1900MHz)	210	275

Table 3-8 ZXSDR R8882 Power Consumption in GSM Single Mode

Items (S4/4, 2PA, TOC 2*60W)	Power Consumption (W)	
	Average	Peak
R8882 (900MHz)	290	445
R8882 (1800MHz)	280	455
R8882 (850MHz)	240	395
R8882 (1900MHz)	320	515

Table 3-9 ZXSDR R8882 Power Consumption in GSM/UMTS Dual-Mode

Items (8G2U, 2PA, TOC 2*(4*10W GSM+20W UMTS)	Power Consumption (W)	
	Average	Peak
R8882 (900MHz)	300	445
R8882 (850MHz	250	395
R8882 (1900MHz)	335	515

3.4 Transmission

ZXSDR R8882 is connected to BBU through CPRI interfaces.

Table 3-10 ZXSDR R8882 CPRI Interfaces

Item	Value	Interface Kind	Speed	Standard

CPRI interface	2	SFP (LC)	1.25Gbps 2.5Gbps 3Gbps	CPRI V4.2

3.5 Working Environment

Table 3-11 ZXSDR R8882 Environment Condition Compatibility

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

3.6 Electromagnetic Compatibility

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)

3.7 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 3-12 ZXSDR R8882 Reliability Characteristics

Item	Index
MTBF	≥322000 hours
MTTR	1 hour
Availability index	≥99.999689%
Down duration	≤1.632min/year

4 Installation

ZXSDR R8882 is easy to be deployed.

- It is portable for transportation and flexible installation on the pole, tower and against wall.
- Only fibers, power cables, RF cable antennas, PE and AISG cables need to be connected.
- It is suitable for any weather condition with IP65 water resistance and dust proof case.

5 Configurations

ZXSDR R8882 can be configured as GSM, UMTS, LTE single mode or mixed mode through software. By choosing different frequencies and software configurations, R8882 can support various GSM/UMTS/LTE configurations. Both R8882 2T4R and 2T2R modules support 2*2 MIMO, and R8882 2T4R supports two cells with 1T2R for each cell.

Table 5-1 ZXSDR R8882 Configuration

Site Type	R8882 Qty
GSM S6/6/6	2
UMTS S2/2/2	
GSM S8/8/8	3
UMTS S2/2/2 2*2 MIMO	
GSM S4/4/4+UMTS S1/1/1	
GSM S8/8/8+UMTS S1/1/1	
GSM S4/4/4+LTE 20M	
UMTS S2/2/2+LTE 20M	

6 Abbreviation

Abbreviation	Full Characters
3GPP	3rd Generation Partnership Project
BBU	Base Band processing Unit
BRACS	Barrier Access Control Sub-system
BRS	Barrier Sub-system
BSP	Board Support Package
CAPEX	Capital Expenditure
CPRI	Common Public Radio Interface
DBS	Data Base Sub-system
GSM	Global System for Mobile communications
IBW	Instantaneous Bandwidth
LMT	Local Maintenance Terminal
MIMO	Multi Input Multi Output
MTBF	Mean Time Between Failures
MTTR	Mean Time To Recovery
OAM	Operating And Maintenance
OPEX	Operation Expenditure
OSS	Operation Support Sub-system
RF	Radio Frequency
RRU	Remote Radio Unit
RTWP	Received Total Wideband Power
SCS	System Control Sub-system
SDR	Software Defined Radio
UE	User Equipment
UMTS	Universal Mobile Telecommunications System