



# ZXSDR R8882 Product Description

UniRAN15/GUL Multi-Mode





## ZXSDR R8882 Product Description

Version	Date	Author	Reviewer	Notes
V1.00	2015-02-12	Yang Lisha, Guo Qing	Chen Yong, Yang Xu, Li Sijun	First release, information of GSM, UMTS and FDD LTE Multi-Mode are included
V1.10	2015-04-15	Yang Lisha, Guo Qing	Chen Yong, Yang Xu, Li Sijun	Modified the cover and the header logo, introduce U/L dual-mode in AWS spectrum

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# 1 Overview

## 1.1 Introduction

ZXSDR R8882 (hereinafter R8882) is one distributed Remote Radio Unit (RRU) used in ZTE Uni-RAN total solution, with two transmitters. Based on the new generation of ZTE common RRU platform, R8882 can work in GSM, UMTS, LTE single mode or Multi-Mode.

R8882 series includes R8882 2\*60W, 2\*40W, 2T2R and 2T4R. They have the same architecture; only differ from each other in power amplifier and physical vision.

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

## 1.2 Benefits

- **Wide Working Bandwidth, Less Hardware Investment**

To meet with the growing demands for wide working bandwidth, R8882 modules with wide 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 wide working bandwidth integrate more spectrum resources and help to decrease hardware investment. (This is the maximum bandwidth of the RF modules. Please make the actual module as the standard.)

In LTE mode, R8882 can deal with 4 separate 1.4M/3M/5MHz or 2 separate 10M/15/20MHz bandwidths carriers. It benefits the operators who do not possess a continuous 20M bandwidth.

- **Clear and Simple Network**

R8882 supports GSM, UMTS, LTE or mixed technologies. It supports Multi-Mode at the same frequency band simultaneously. 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 low cost.

- **MIMO Capable, Better Performance**

R8882 supports 2T4R in one box, which optimizes spectrum efficiency greatly and improves network uplink performance. It brings better experience to customers.

- **High PA Efficiency, Low Power Consumption**

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 with these features.

## 1.3 Application Scenarios

R8882s and one base band unit (BBU) form a complete BTS/NodeB. It implements radio transmission, controls radio channels and communicates with the Base Station Controller (BSC/RNC). It supports indoor and outdoor applications.

# 2 Product Architecture

## 2.1 Physical Structure

R8882 is the multi-carrier RF module with two transmitters. Now ZTE provides R8882 series, including R8882 2\*60W, 2\*40W, 2T2R and 2T4R. R8882s with different output power have the same architecture but differ in the power amplifier and physical indices.

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 has two. The physical appearance is shown as follows.

Figure 2-1 R8882 (2\*60W) Physical Appearance



Figure 2-2 R8882 (2\*40W) Physical Appearance



R8882 has two PAs, with both PAs working on the same bands, or one PA in 900MHz and the other in 1800MHz. With SDR platform, R8882 supports GSM, UMTS or LTE single mode or mixed-mode through software configuration.

## 2.2 Hardware Structure

R8882 includes the following main hardware modules:

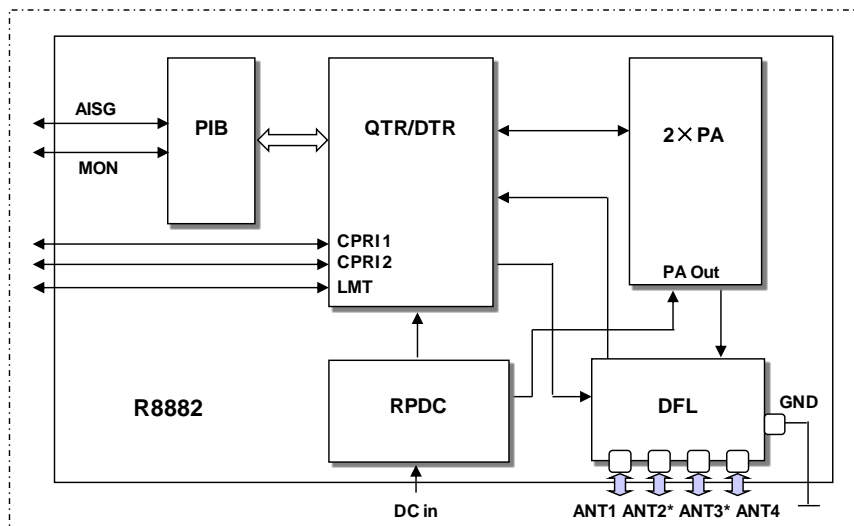
- Quad-channel Transceiver (QTR) or Dual-channel Transceiver (DTR)



- Duplex Filters (DFL)
- 2 \* Power Amplifier (PA)
- RRU Power for DC (RPDC)
- Lightning protection module(PIB)

The hardware structure of R8882 is shown below.

Figure 2-3 R8882 System Structure



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

### 2.2.1 QTR/DTR

The QTR/DTR module has following functions:

- QTR processes 4 received signals and 2 transmitted signals
- DTR processes 2 received signals and 2 transmitted signals
- Processes radio signal Up/Down conversion
- Processes Downlink IQ signal multiplexing and uplink signal de-multiplexing
- Processes signal amplifying, filtering, A/D conversion and D/A conversion

- Converts between optical and electric signals
- Captures reference clock signals from baseband unit and provide clock signals to other units
- Supports Voltage Standing Wave Ratio (VSWR) measurement and report;
- Communicates with baseband unit and cascading RRU
- Supports radio frequency hopping function
- Supports adaptive modulation rate processing
- Supports hardware failure self-detection and alarm
- Supports over-heat detection and alarming
- Provides communication interfaces, including,
  - Two CPRI interfaces
  - One RS485 serial port for external monitor equipment communication
  - One AISG for electrical tilt antenna, and
  - One Fast Ethernet port for LMT
- Supports reset function

### **2.2.2 DFL**

The DFL module 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 PA

There are 2 PAs and 4 (or 2) LNAs included and following functions are provided:

- 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 RPDC

The RPDC module 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)
- Protects the RS485 monitoring signals
- Provides adaptation for external MON interface, AISG interface, and power interface
- Provides the hardware version identifiers of boards

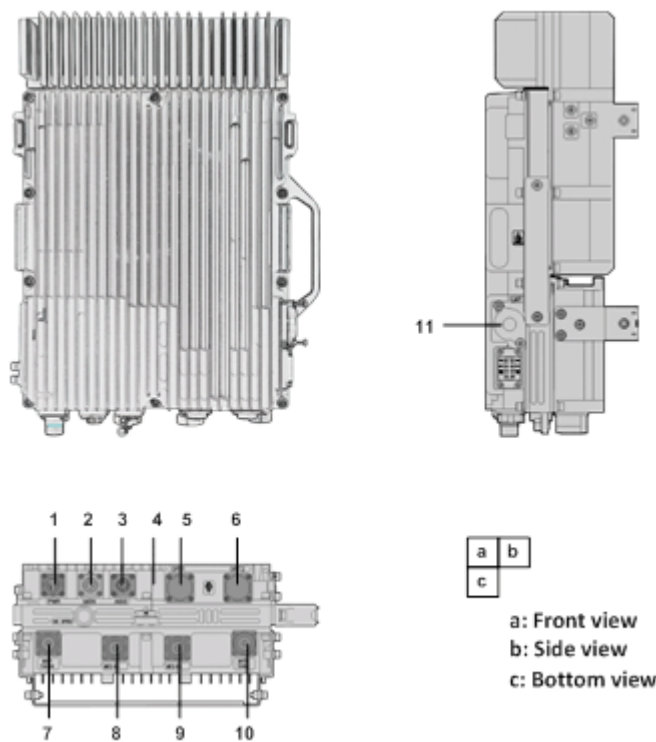
### 2.2.5 PIB

- Provides lightning protection for the AISG, RS485 and dry contacts

## 2.3 External Interfaces

R8882 external interfaces are located at the bottom and side, as shown in Figure 2-4.

Figure 2-4 R8882 External Interfaces



The interfaces are described in the following table.

Table 2-1 R8882 External Interfaces Description

S.N.	Label	Interface	Interface Type/Connector
1	PWR	-48V DC power input interface	2-pin round plastic connector (male)
2	MON	External monitoring interface	8-pin circle connector (male)

3	AISG	AISG interface	8-pin circle connector (IEC 60130-9-ED) (female)
4	GND	PE interface	16 mm <sup>2</sup> yellow-green round terminal
5	OPT1	BBU and RRU Interface/RRU cascading interface	LC-mode optical interface (IEC 874)
6	OPT2	RRU cascading interface	LC-mode optical interface (IEC 874)
7	ANT1 (TX0/RX0)	Antenna feeder interface (Tx0/Rx0)	50 $\Omega$ DIN-mode connector
8	ANT2 (RX2) (Optional*)	Antenna feeder interface (Rx2)	50 $\Omega$ DIN-mode connector
9	ANT3 (RX3) (Optional*)	Antenna feeder interface (Rx3)	50 $\Omega$ DIN-mode connector
10	ANT4 (TX1/RX1)	Antenna feeder interface (Tx1/Rx1)	50 $\Omega$ DIN-mode connector
11	LMT	Ethernet interface for operation and maintenance	RJ45

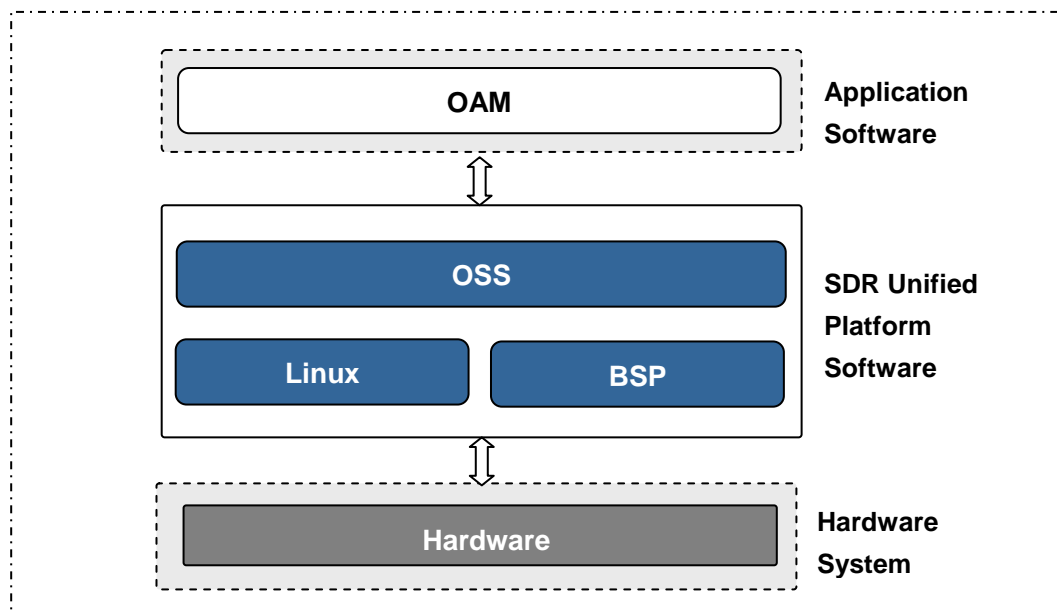
Optional\*: For R8882 2T2R, ANT3 and ANT2 interfaces do not exist.

R8882 S8000 and S7200 has 2T2R only, and the other modules has

## 2.4 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 figure.

Figure 2-5 ZXSDR R8882 Software Architecture



The Operating and Maintenance (OAM) sub-system is the application layer. Its main functions include 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 like 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 related interfaces and services to the Operating System.

## 2.5 Functionality

R8882 supports the following functionalities:

- Supports DD/2600MHz by R8882 2\*40W
- Supports APAC700M/810M/850M/900M/1800M/1900M/AWS/2100MHz by R8882 2\*60W

- Support the LTE scalable bandwidth configurations of 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz
- Support 2T2R/2T4R in one box which can optimize spectrum efficiency greatly and improve network uplink performance
- supports two cells configuration with 2T4R module
- Supports 2\*2 MIMO configuration
- Supports GSM only, UMTS only, LTE only or mixed mode
- Support 64QAM modulation in both downlink and uplink for LTE
- Supports RTWP report interval at 100ms and 2ms
- Supports transmit power reporting function for every carrier
- Supports overload 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
- Supports no affect to the running of BBU and other R8882s that are connected to the failure R8882

## 3 Technical Specifications

### 3.1 Physical Indices

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

Table 3-1 R8882 (2\*60W) Physical Indices

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

Table 3-2 R8882 (2\*40W) Physical Indices

Item	Index
Dimension (H*W*D)	380*320*140 mm (17L)
Weight	20kg
Color	Silver gray

## 3.2 Performance Indices

### 3.2.1 Operation Frequency Band

Table 3-3 R8882 (2\*60W) Frequency Spectrum

System	RRU Frequency Spectrum(MHz)
GSM single mode	850/900/1800/1900
UMTS single mode	850/900/1900/2100
LTE single mode	APAC700/810/850/900/1800/1900/2100/AWS
GU Dual-Mode	850/900/1900, or GU Dual-Mode in 900MHz of one PA, and GSM single mode in 1800MHz of the other PA
GL Dual-Mode	900/1800
UL Dual-Mode	2100/AWS

Table 3-4 R8882 (2\*40W) Frequency Spectrum

System	RRU Frequency Spectrum(MHz)
LTE single mode	DD/2600

Note: The actual working bandwidth and IBW are subject to the products configured.



### 3.2.2 Capacity

Table 3-5 R8882 Capacity

System	RRU Capacity
GSM single mode	12 TRXs, or 6 TRXs@900MHz + 6 TRXs@1800MHz
UMTS single mode	8 carriers (non-MIMO), or 4 carriers (MIMO)
LTE single mode	1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz
GU Dual-Mode	8 GSM TRXs + 2 UMTS carriers, or 4 GSM TRXs + 4 UMTS carriers
GL Dual-Mode 900MHz	8 GSM TRXs + LTE10MHz
GL Dual-Mode 1800MHz	8 GSM TRXs + LTE 20MHz
UL Dual-Mode	2 UMTS carriers (MIMO) + LTE 20MHz

### 3.2.3 Static Receiving Sensitivity

Table 3-6 R8882 Static Receiver Sensitivity

Mode	Frequency Spectrum(MHz)	Single Antenna (dBm)	Dual Antennas (dBm)	Four Antennas (dBm)
GSM	850/900/1800/1900	-113.5	-115.5	N/A
UMTS	2100	-126.5	-129.2	N/A
	850/900/1900/AWS	-126.4	-129.1	N/A
LTE	APAC700/DD	-106.6	-109.4	N/A
	850/900	-106.6	-109.4	-112.2
	1800/1900/2100/2600/AWS	-106.4	-109.2	-112

### 3.2.4 TOC Output Power

Table 3-7 R8882 TOC Output Power and Transmitting & Receiving Channels

Type	TOC <sup>[1]</sup>	Working Frequency Band	2T2R or 2T4R <sup>[2]</sup>
R8882 S9000	2*60W	B8 TX: 925 MHz - 960 MHz RX: 880 MHz - 915 MHz	2T4R/2T2R
R8882 S1800	2*60W	B3 Type1: TX: 1805MHz - 1860MHz RX: 1710MHz - 1765MHz Type2: TX: 1825MHz - 1880MHz RX: 1730MHz - 1785MHz	2T4R/2T2R
R8882 S2100	2*60W	B1 TX: 2110MHz - 2170 MHz RX: 1920MHz - 1980 MHz	2T4R/2T2R
R8882 S2600	2*40W	B7 TX: 2620MHz -2690MHz RX: 2500MHz -2570MHz	2T4R/2T2R
R8882 S8500	2*60W	B5 TX: 869MHz - 894MHz RX: 824MHz - 849MHz	2T4R/2T2R
R8882 S1900	2*60W	B2 TX: 1930MHz - 1990MHz RX: 1850MHz - 1910MHz	2T4R/2T2R
R8882 S7200 (APAC 700)	2*60W	B28 TX: 758MHz - 803MHz RX: 703MHz - 748MHz	2T2R
R8882 S8000 (DD)	2*40W	B20 TX: 791MHz - 821MHz RX: 832MHz - 862MHz	2T2R

<sup>1</sup> The TOC here means the max capacity. The specific TOC would be limited by the license.

<sup>2</sup> 2T means 2-antenna transmission; 2R means 2-antenna reception; and so on.

Type	TOC <sup>[1]</sup>	Working Frequency Band	2T2R or 2T4R <sup>[2]</sup>
R8882 S8100	2*60W	B27 TX: 851MHz - 869MHz RX: 806MHz - 824MHz	2T4R/2T2R
R8882 S1700 (AWS)	2*60W	B4 TX: 2110 MHz - 2155 MHz RX: 1710 MHz - 1755 MHz	2T4R/2T2R

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.

### 3.3 Power Indices

#### 3.3.1 Power Supply

Table 3-8 R8882 Power supply indices

Module	Input Power
R8882 (2*60W)	DC: -48 V (-37 V - -60 V DC) AC: 110 V/220 V (90 V - 290 V AC) (by AC/DC lightning protection unit)
R8882 (2*40W)	DC: -48 V (-37 V - -60 V DC)

#### 3.3.2 Power Consumption

Table 3-9 R8882 Power Consumption in UMTS Single Mode

Configuration: S2/2, 2PA, TOC 20W/UMTS carrier		
Module	Average PC (W)	Peak PC (W)
R8882 S9000	240	345
R8882 S2100	210	320
R8882 S8500	195	290
R8882 S1900	275	410

Table 3-10 R8882 Power Consumption in GSM Single Mode

<b>Configuration: S4/4, 2PA, TOC 15W/GSM TRX</b>		
<b>Module</b>	<b>Average PC (W)</b>	<b>Peak PC (W)</b>
R8882 S9000	290	445
R8882 S1800	280	455
R8882 S8500	240	395
R8882 S1900	320	515

Table 3-11 R8882 Power Consumption in LTE Single Mode

<b>Configuration: LTE single carrier, 2PA, 60W/LTE</b>		
<b>Module</b>	<b>Average PC (W)</b>	<b>Peak PC (W)</b>
R8882 S8000 (DD)	185	315
R8882 S2600	215	385
R8882 S7200 (APAC 700)	230	440
R8882 S8100	230	440
R8882 S8500	230	440
R8882 S9000	230	440
R8882 S1800	275	485
R8882 S1900	275	485
R8882 S1700	285	505
R8882 S2100	285	505

Table 3-12 R8882 Power Consumption in GSM/UMTS Dual-Mode

<b>Configuration: 8G2U, TOC 10W/GSM TRX+ 20W/UMTS carrier</b>		
<b>Module</b>	<b>Average PC (W)</b>	<b>Peak PC (W)</b>
R8882 S9000	300	445
R8882 S8500	250	395
R8882 S1900	335	515

Table 3-13 R8882 Power Consumption in GSM/LTE Dual-Mode

<b>Configuration: 8G1L, 2PA, TOC 10W/GSM TRX+20W/LTE</b>		
----------------------------------------------------------	--	--

Module	Average PC (W)	Peak PC (W)
R8882 S9000	350	485
R8882 S1800	345	475

Table 3-14 R8882 Power Consumption in UMTS/LTE Dual-Mode

Configuration: 2U1L, TOC 20W/UMTS carrier+20W/LTE		
Module	Average PC (W)	Peak PC (W)
R8882 S2100	300	505

### 3.4 Transmission

R8882 is connected to BBU through CPRI interfaces.

Table 3-15 R8882 CPRI Interfaces

Item	Value	Interface Kind	Speed	Standard
CPRI interface	2	SFP (LC)	2.4576Gbps 3.072Gbps	CPRI V4.2

### 3.5 Working Environment

Table 3-16 R8882 Environment Condition Compatibility

Item	Index
Temperature	-40 - +55 °C
Relative humidity	5% - 95%
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 3-17 R8882 Reliability Characteristics

Item	Index
MTBF	≥464,000 hours
MTTR	1 hour
Availability index	≥99.999784%
Down duration	≤1.133 min/year

## 4 Installation

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

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.

## 6 Abbreviation

Abbreviation	Full Characters
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
LMT	Local Maintenance Terminal
LTE	Long Term Evolution
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