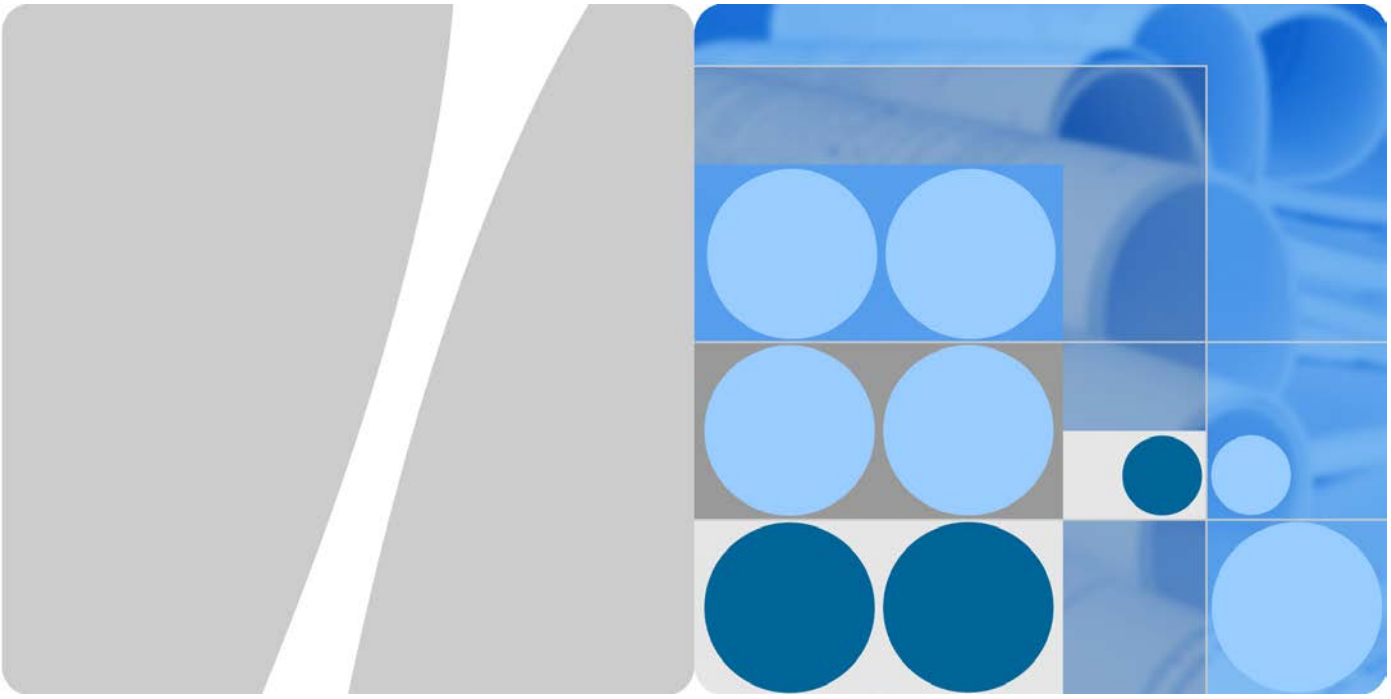

RRU3971 Description

Issue 05

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Contents

1 Introduction

The RRU3971 is an outdoor remote radio unit. It is the radio frequency (RF) part of a distributed base station and can be located near antennas. The RRU3971 can modulate, demodulate, combine, and divide baseband and RF signals. It also processes baseband and RF signal data. With the software-defined radio (SDR) technology, the RRU3971 supports the triple-mode or dual-mode operation of any two modes of GSM, UMTS, and LTE through software configuration modification. Also, RRU3971 supports LN, or GLN mode.

Adopting an innovative design, RRU3971 is able to work in 4 TX and 4 RX mode and therefore supports higher output power and larger carrier capacity.

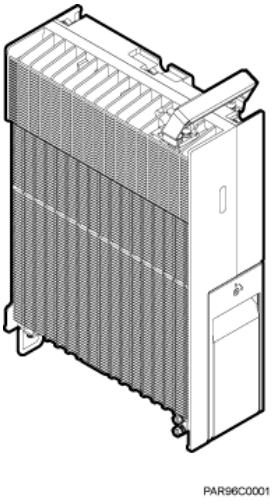
The software version of the RRU3971 (1800 MHz/1900 MHz/AWS) is SRAN11.1, which is compatible with the N-1 and N-2 versions of MBTS, MBSC, and OSS NEs. Therefore, the RRU3971 can be used with products of SRAN9.0, SRAN10.1 and SRAN11.1 versions. All these three versions include the RRU3971 software components. The RRU3971 used in SRAN9.0, SRAN10.1 and SRAN11.1 has no impact on the KPI of products.

The software version of the RRU3971 (2100 MHz) is SRAN12.0, which is compatible with the N-1 and N-2 versions of MBTS, MBSC, and OSS NEs. Therefore, the RRU3971 can be used with products of SRAN10.1, SRAN11.1 and SRAN12.0 versions. All these three versions include the RRU3971 software components. The RRU3971 used in SRAN10.1, SRAN11.1, and SRAN12.0 has no impact on the KPI of products.

1.1 Appearance

Figure 1-1 shows the appearance of the RRU3971.

Figure 1-1 Appearance of the RRU3971



1.2 Physical Ports

RRUs have a modular design. Its external ports are located in the cabling cavity and at the bottom of the module.

Figure 1-2 shows and Table 1-1 describes the physical ports on the RRU3971.

Figure 1-2 Ports on the RRU3971 panels

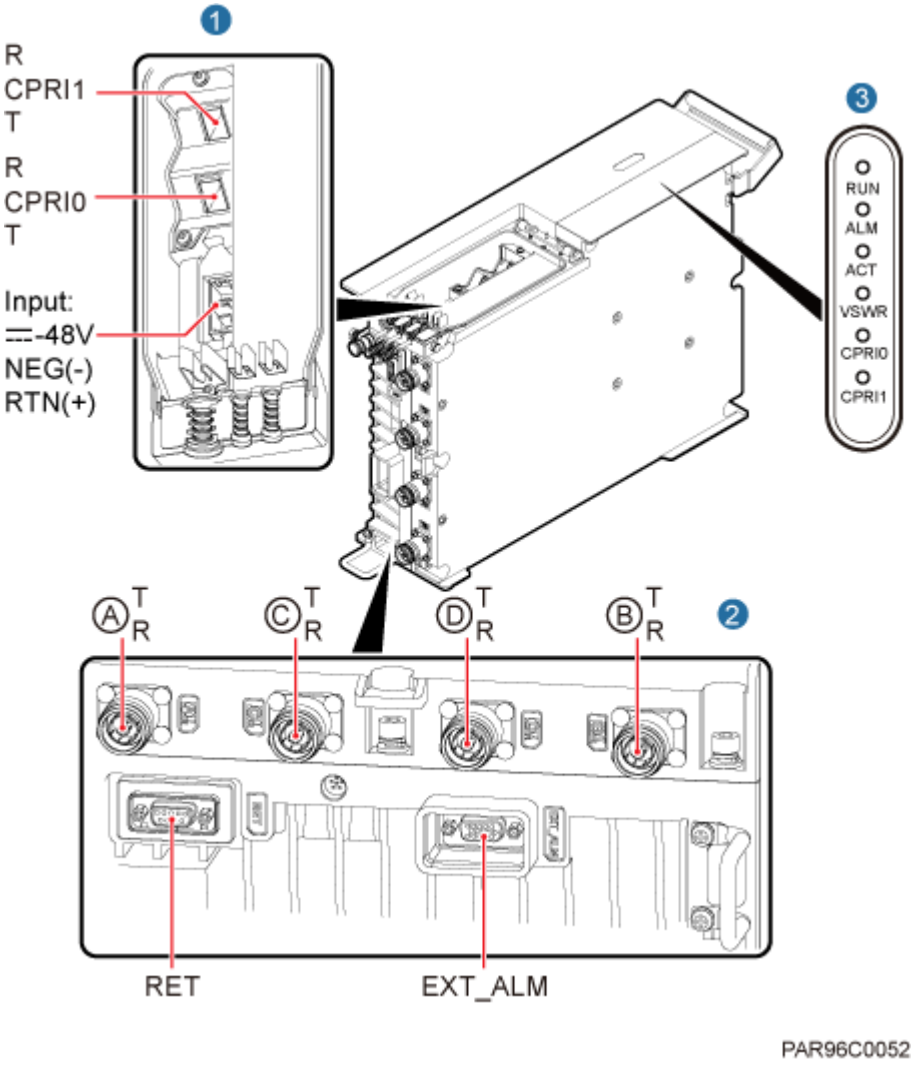


Table 1-1 Physical ports on the RRU3971

Port	Connector	Quantity	Function
RF port	4.3-10 connector	4	Connects to the antenna.
Common public radio interface (CPRI) port	DLC	2	Connects to the baseband unit (BBU).
Power supply socket	Easy power receptacle (pressfit type)	1	Receives –48 V DC power.
RET port	DB9	1	Connects to a remote control unit (RCU).
Alarm port	DB15	1	Receives alarm signals from external devices.

2 Technical Specifications

2.1 Frequency Band

Table 2-1 RRU3971 frequency band

Type	Frequency Band (MHz)	RX Frequency Band (MHz)	TX Frequency Band (MHz)	IBW (MHz)
RRU3971	1800	1710 to 1785	1805 to 1880	45
	1900	1850 to 1910	1930 to 1990	40
	AWS	1710 to 1780	2110 to 2180	70
	2100	1920 to 1980	2110 to 2170	60

NOTE

In versions earlier than SRAN11.1, the RRU3971 (AWS) supports only the band 4 configuration (the RX frequency band of 1710 MHz to 1755 MHz and the TX frequency band of 2110 MHz to 2155 MHz).

2.2 Capacity

Table 2-2 Single-mode capacity

Mode	Capacity
UMTS	(Only AWS/1900 MHz/2100 MHz frequency band supported) Each RRU3971 supports eight carriers without MIMO.
LTE	Each RRU3971 supports 2 carriers. The LTE bandwidth is 5, 10, 15, or 20 MHz.

Table 2-3 Multi-mode capacity

Mode	Capacity
GSM+UMTS	(Only 1900 MHz frequency band supported) For detailed specifications, see Table 2-7.
GSM+LTE	(Only 1800 MHz/1900 MHz frequency band supported) For detailed specifications, see Table 2-8.
UMTS+LTE	(Only AWS/1900 MHz/2100 MHz frequency band supported) For detailed specifications, see Table 2-9.
GSM+UMTS +LTE	(Only 1900 MHz frequency band supported) For detailed specifications, see Table 2-10.
LTE (FDD)+NR	(Only 1800 MHz frequency band supported) For detailed specifications, see Table 2-11.
GSM +LTE (FDD)+NR	(Only 1800 MHz frequency band supported) For detailed specifications, see Table 2-12.

2.3 Receiver Sensitivity

Table 2-4 RRU3971 receiver sensitivity

Mode	Frequency Band (MHz)	1-Way Receiver Sensitivity (dBm)	2-Way Receiver Sensitivity (dBm)	4-Way Receiver Sensitivity (dBm)
GSM	1800/1900	–113.4	–116.2	–118.9
UMTS	1900/AWS/2100	–125.8	–128.6	–131.3
LTE	1800/1900/AWS/ 2100	–106.0	–108.8	–111.5

NOTE

- The receiver sensitivity of GSM, as recommended in 3GPP TS 51.021, is measured in the central band at the antenna connector on condition that the channel rate is 13 kbit/s and the bit error rate (BER) is not higher than 2%.
- The receiver sensitivity of UMTS, as recommended in 3GPP TS 25.104, is measured in the entire operating band at the antenna connector on condition that the channel rate reaches 12.2 kbit/s and the BER is not higher than 0.001.
- The receiver sensitivity of LTE is measured, as recommended in 3GPP TS 36.104, under a 5 MHz channel bandwidth based on the FRC A1-3 in Annex A.1 (QPSK, R = 1/3, 25 RBs) standard.

2.4 Typical Output Power

NOTE

- The RRU3971 does not support the configuration of GSM Only.
- RRU3971 modules operating in UMTS, LTE, or Multi-Standard Radio (MSR) mode and in 1900 MHz frequency band comply with the 3GPP TS 37.104 V10.4.0 and TS 37.141 V10.4.0 standards.
- The output power is 1 dB less than the standard power when the RRU3971 is located at a height of 3500 m to 4500 m; and is 2 dB less than the standard power when the RRU3971 is located at a height of 4500 m to 6000 m.
- Factors such as the inter-site distance, frequency reuse factor, power control algorithm, and traffic model affect the gain achieved by dynamic power allocation. Therefore, in most cases, the network planning can be based on the power specification achieved by dynamic power allocation.
- In power sharing mode, the power control and DTX functions must be enabled. In GBSS8.1, the dynamic power sharing feature is mutually exclusive with the GBFD-113201 Concentric Cell, GBFD-114501 Co-BCCH Cell, GBFD-118001 BCCH Dense Frequency Multiplexing, and GBFD-117501 Enhanced Measurement Report (EMR) features. In GBSS9.0 and later versions, the dynamic power sharing feature can be used together with these features. However, the dynamic power sharing feature currently cannot be used together with the GBFD-117002 IBCA (Interference Based Channel Allocation), GBFD-117001 Flex MAIO, GBFD-118701 RAN Sharing, and GBFD-114001 Extended Cell features in GBSS8.1, GBSS9.0, and later versions.
- Power sharing assumes a random distribution of UEs in the cell.
- The output power per carrier in the output power table provides the maximum output power possible while ensuring the network performance.
- When two LTE carriers are configured, it is recommended that the power spectrum density (PSD) of the two carriers be set to the same value. Power spectrum density = Carrier output power/Carrier bandwidth (1.4 MHz and 3 MHz bandwidths are considered as 5 MHz bandwidth in this formula.)
- In Table 2-7, Table 2-8 and Table 2-10, the eGBTS supports 4T channels only in SRAN12.0 and later versions, and supports 2T channels in earlier versions. The GBTS supports 4T channels only in SRAN11.1 and later versions, and supports 2T channels in earlier versions.

Table 2-5 Typical output power of the RRU3971 (4 x 40 W, AWS/1900 MHz/2100 MHz, UMTS single-mode)

Number of UMTS Carriers	Output Power per UMTS Carrier (W)
4	40
8	20

Table 2-6 Typical output power of the RRU3971 (4 x 40 W, AWS/1800 MHz/1900 MHz/2100 MHz, LTE single-mode)

Number of LTE Carriers	Output Power per LTE Carrier (W)	Bandwidth of LTE Carrier (MHz)
1 (MIMO)	4x40	5, 10, 15, 20
2 (MIMO)	4x20	5, 10, 15, 20

NOTE

In Table 2-7 and Table 2-8, (1) indicates that GSM carriers can only be evenly configured on channels A and B, and (2) indicates that GSM carriers can be evenly configured on channels A, B, C, and D.

Table 2-7 Typical output power of the RRU3971 (4 x 40 W, 1900 MHz, GU MSR)

Number of GSM Carriers	Number of UMTS Carriers	Output Power per GSM Carrier (W)	Output Power per UMTS Carrier (W)
2(1)	8(1)	20(1)	10(1)
4(1)	8(1)	10(1)	10(1)
4(2)	8(2)	20(2)	10(2)
8(2)	4(2)	10(2)	20(2)

Table 2-8 Typical output power of the RRU3971 (4 x 40 W, 1800 MHz/1900 MHz, GL MSR)

Number of GSM Carriers	Number of LTE Carriers	Output Power per GSM Carrier (W)	Output Power per LTE Carrier (W)	Bandwidth of LTE Carrier (MHz)
2 (1)	1 (MIMO) (1)	15 (1)	4 x 25 (1)	5, 10, 15, 20 (1)
2 (1)	1 (MIMO) (1)	20 (1)	4 x 20 (1)	5, 10, 15, 20 (1)
2 (1)	2 (MIMO) (1)	20 (1)	4 x 10 (1)	5, 10, 15, 20 (1)
4 (1)	1 (MIMO) (1)	10 (1)	4 x 20 (1)	5, 10, 15, 20 (1)
4 (1)	1 (MIMO) (1)	15 (1)	4 x 10 (1)	5, 10, 15, 20 (1)
4 (1)	2 (MIMO) (1)	10 (1)	4 x 10 (1)	5, 10, 15, 20 (1)
4 (2)	1 (MIMO) (2)	15 (2)	4 x 25 (2)	5, 10, 15, 20 (2)
4 (2)	1 (MIMO) (2)	20 (2)	4 x 20 (2)	5, 10, 15, 20 (2)
4 (2)	2 (MIMO) (2)	20 (2)	4 x 10 (2)	5, 10, 15, 20 (2)
8 (2)	1 (MIMO) (2)	10 (2)	4 x 20 (2)	5, 10, 15, 20 (2)
8 (2)	1 (MIMO) (2)	15 (2)	4 x 10 (2)	5, 10, 15, 20 (2)

NOTE

In Table 2-9, (3) indicates that the configuration is supported only when the RRU3971 works in the 2100 MHz frequency band.

Table 2-9 Typical output power of the RRU3971 (4 x 40 W, AWS/1900 MHz/2100 MHz, UL MSR)

Number of UMTS Carriers	Number of LTE Carriers	Output Power per UMTS Carrier (W)	Output Power per LTE Carrier (W)	Bandwidth of LTE Carrier (MHz)
4	1 (MIMO)	20	4 x 20	5, 10, 15, 20
4 (3)	1 (MIMO) (3)	10 (3)	4 x 30 (3)	5, 10, 15, 20 (3)
4	2 (MIMO)	20	4 x 10	5, 10, 15, 20
4 (3)	2 (MIMO) (3)	10 (3)	4 x 15 (3)	5, 10, 15, 20 (3)

Table 2-10 Typical output power of the RRU3971 (4 x 40 W, 1900 MHz, GUL MSR)

Number of GSM Carriers	Number of UMTS Carriers	Number of LTE Carriers	Output Power per GSM Carrier (W)	Output Power per UMTS Carrier (W)	Output Power per LTE Carrier (W)	Bandwidth of LTE Carrier (MHz)
4	4	1 (MIMO)	10	10	4 x 20	5, 10, 15, 20
4	4	1 (MIMO)	15	15	4 x 10	5, 10, 15, 20

Table 2-11 Uplink frequency spectrum sharing of the RRU3971 (1800 MHz, LN, 4R)

Number of LTE (FDD) Carriers	Number of NR Carriers	Bandwidth of LTE (FDD) Carrier (MHz)	Bandwidth of NR Carrier (MHz)
2	1	15, 20	15, 20

Table 2-12 Uplink frequency spectrum sharing of the RRU3971 (1800 MHz, GLN, 4R)

Number of GSM Carriers	Number of LTE (FDD) Carriers	Number of NR Carriers	Bandwidth of LTE (FDD) Carrier (MHz)	Bandwidth of NR Carrier (MHz)
2	1	1	15, 20	15, 20

2.5 Power Consumption

NOTE

- The typical power consumption and the maximum power consumption are measured when the base station works at a temperature of 25°C.
- The typical power consumption for GSM is reached when the base station works with 30% load. The maximum power consumption for GSM is reached when the base station works with 100% load.
- The typical power consumption for UMTS is reached when the base station works with 40% load. The maximum power consumption for UMTS is reached when the base station works with 100% load.
- The typical power consumption for LTE is reached when the base station works with 50% load. The maximum power consumption for LTE is reached when the base station works with 100% load.
- This section describes the power consumption of an entire base station. Board configurations in a BBU are as follows:
  - GSM: one GTMU
  - UMTS: one UMPTb1 and one WBBPf3 in 3 x 1 and 3 x 2 scenarios, one UMPTb1 and two WBBPf3s in 3 x 3 and 3 x 4 scenarios, one UMPTb1 and two WBBPf3s in 3 x 8 scenarios
  - LTE FDD: one UMPTb1 and one UBBPd5 when one carrier is configured

Table 2-13 Power consumption of the DBS3900 (Ver.D) (–48 V) (configured with the RRU3971, 4 x 40 W, 1800 MHz)

Mode	Configuration	Output Power per Carrier (W)	Typical Power Consumption (W)	Maximum Power Consumption (W)
LTE	3 x 20 MHz, 1 carrier	4 x 40	1265	1760
GSM+LTE	GSM S2/2/2 + LTE 3 x 20 MHz, 1 carrier	GSM: 20 LTE: 4 x 20	1040	1325

Table 2-14 Power consumption of the DBS3900 (Ver.D) (–48 V) (configured with the RRU3971, 4 x 40 W, 1900 MHz)

Mode	Configuration	Output Power per Carrier (W)	Typical Power Consumption (W)	Maximum Power Consumption (W)
UMTS	3 x 8	20	1385	1955
LTE	3 x 20 MHz, 2 carriers	4 x 20	1250	1685
GSM+UMTS	GSM S4/4/4 + UMTS 3 x 8	GSM: 10 UMTS: 10	1350	1740
GSM+LTE	GSM S2/2/2 + LTE 3 x 20 MHz, 1 carrier	GSM: 20 LTE: 4 x 20	1085	1410

UMTS+LTE	UMTS 3 x 4 + LTE 3 x 20 MHz, 1 carrier	UMTS: 20 LTE: 4 x 20	970	1220

Table 2-15 Power consumption of the DBS3900 (Ver.D) (–48 V) (configured with the RRU3971, 4 x 40 W, 2100 MHz)

Mode	Configuration	Output Power per Carrier (W)	Typical Power Consumption (W)	Maximum Power Consumption (W)
UMTS	3 x 8	20	1505	1925
LTE	3 x 20 MHz, 2 carriers	4 x 20	1015	1445
UMTS+LTE	UMTS 3 x 4 + LTE 3 x 20 MHz, 1 carrier	UMTS: 20 LTE: 4 x 20	755	1020

Table 2-16 Power consumption of the DBS3900 (Ver.D) (–48 V) (configured with the RRU3971, 4 x 40 W, AWS)

Mode	Configuration	Output Power per Carrier (W)	Typical Power Consumption (W)	Maximum Power Consumption (W)
UMTS	3 x 8	20	1475	1895
LTE	3 x 20 MHz, 2 carriers	4 x 20	1205	1645
UMTS+LTE	UMTS 3 x 4 + LTE 3 x 20 MHz, 1 carrier	UMTS: 20 LTE: 4 x 20	955	1215

2.6 Input Power

Table 2-17 Input power

Item	Specifications
Input power	–48 V DC; voltage range: –36 V DC to –57 V DC **NOTE** The RRU3971 supports AC power supply when connected to an external AC/DC power module or an OPM15M. For details, see *AC/DC Power Module User Guide* and *OPM15M User Guide*.

2.7 Equipment Specifications

Table 2-18 Equipment specifications

Item	Specifications
Dimensions (H x W x D)	400 mm x 300 mm x 100 mm (without the housing)
Weight	15 kg (without the housing)

2.8 CPRI Port Specifications

Table 2-19 CPRI port specifications

Item	Specifications
Number of CPRI ports	2
CPRI data rate	1.25 Gbit/s, 2.5 Gbit/s, 4.9 Gbit/s, and 9.8 Gbit/s
Topology	Star, chain, or dual-star
Cascading levels	CPRI MUX: • GU: Six levels • GL: Four levels • UL: Four levels • GUL: Four levels
Maximum distance from the BBU	• GU (dual-star/CPRI MUX): 40 km • In the GL, UL and GUL mode (dual-star/CPRI MUX), the maximum distances of the RRUs from the BBU vary with the types of BBP in LTE mode as follows: ▪ LBBPd1/UBBPd3: 20 km ▪ LBBPd2/UBBPd4: 40 km ▪ LBBPd3/UBBPd5/UBBPd6: - Number of LTE cells ≤ 3: 40 km - Number of LTE cells > 3: 20 km

2.9 Environment Specifications

Table 2-20 Environment specifications

Item	Specifications
Operating temperature	With solar radiation: –40°C to +45°C Without solar radiation: –40°C to +50°C
Relative humidity	5% RH to 100% RH
Absolute humidity	1 g/m^3 to 30 g/m^3
Atmospheric pressure	70 kPa to 106 kPa
Operating environment	The RRU complies with the following standards: • 3GPP TS 45.005 • 3GPP TS 25.141 • 3GPP TS 36.141 • 3GPP TS 37.141 • ETSI EN 300019-1-4 V2.1.2 (2003-04) Class 4.1: "Non-weather protected locations"
Shockproof protection	NEBS GR63 zone4
Ingress Protection (IP) rating	IP65

3 Acronyms and Abbreviations

Table 3-1 Acronyms and abbreviations

Abbreviation	Full Name
3GPP	3rd Generation Partnership Project
BBU	Baseband Unit
BER	Bit Error Ratio
CPRI	Common Public Radio Interface
DTX	Discontinuous Transmission
LBBP	LTE BaseBand Processing Unit
LTE	Long Term Evolution
MIMO	Multi-input and Multi-output
MSR	Multi-Standard Radio
RAN	Radio Access Network
RNC	Radio Network Controller
RRU	Remote Radio Unit
SDR	Software Defined Radio