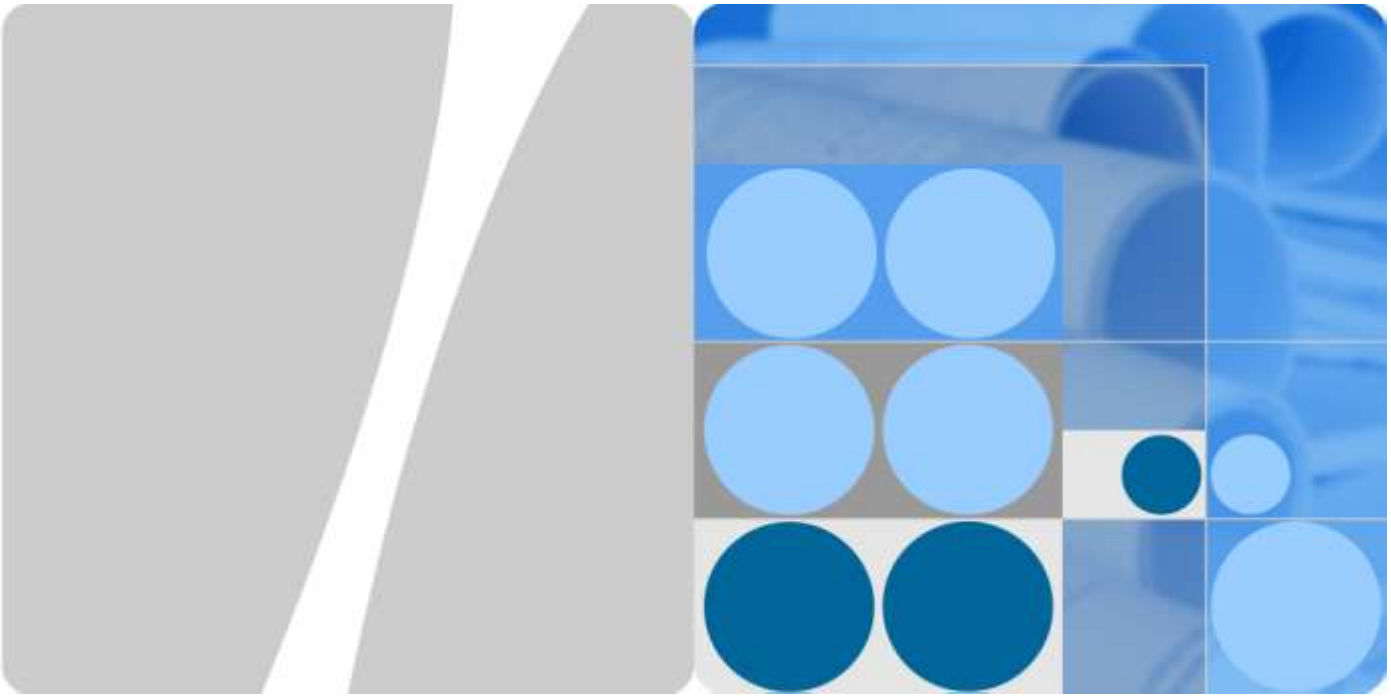

GBSS9.0 DBS3900 Product Description

Issue V2.1

Date 20011-02-28

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Contents

1 Introduction

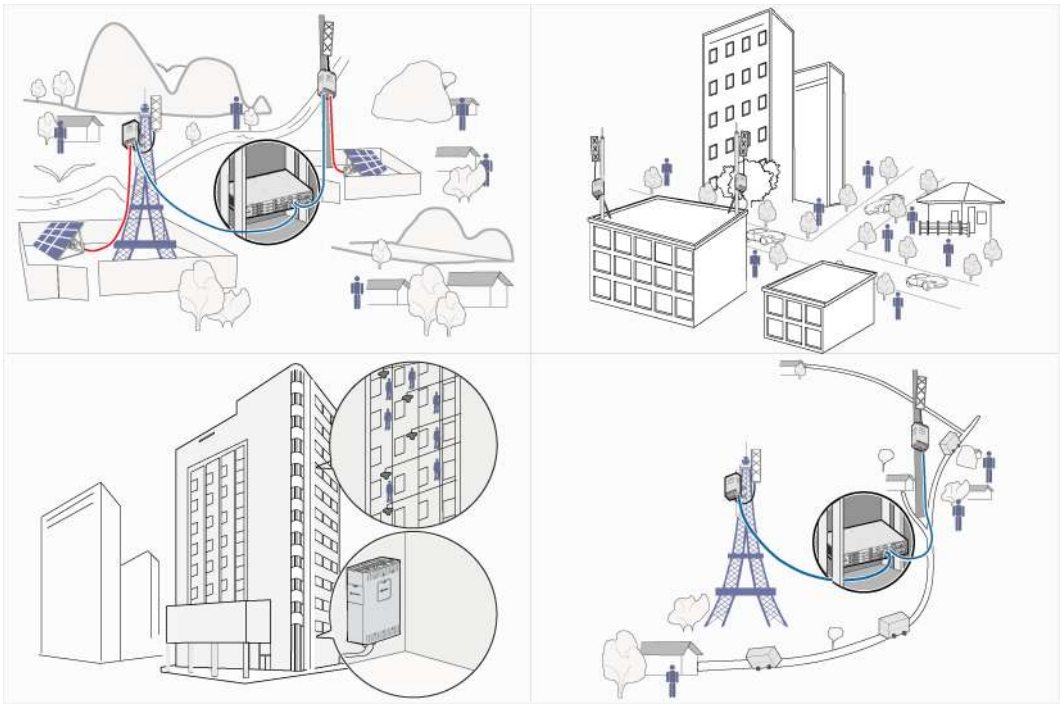
1.1 Positioning

Rapid developments of the mobile communication technologies accelerate the network upgrade pace. With shorter life cycle, multiple technologies such as GSM, UMTS, and LTE are bound to exist in parallel. To cater present market demands, network operators are forced to incur huge expenditure (OPEX and CAPEX) to maintain and sustain market position, and hence nowadays operators are focusing on merging multiple systems into a more cost effective one.

To simplify the complex network environment and cater to the present market challenges effectively. Huawei has launched the top-of-the-line distributed base station, the DBS3900 GSM (hereinafter referred to as DBS3900), which aims at constructing future-oriented networks for operators. With two basic functional modules, the DBS3900 features compact structure, high integration, low power consumption, easy installation, and quick deployment. Through flexible combinations of the functional modules, the DBS3900 is applicable for diverse installations.

Figure 1-1 shows the typical application of the DBS3900.

Figure 1-1 Typical application of the DBS3900



1.2 Benefits

Simple Structure and Quick Network Deployment

The DBS3900 has two types of basic functional modules, thus greatly reducing the investment in spare parts and maintenance. With excellent environment adaptability, the basic modules can be flexibly combined according to the actual site conditions to achieve efficient site deployment, posing no requirement for an equipment room. DBS3900 facilitates convergent solution by enabling modules of different network mode to share the transmission medium and network management system.

Flexible Installation and Diversified Scenarios

The DBS3900 is adaptable to various installation scenarios. Since the RF module of the DBS3900 can be mounted on the tower, the cost of feeders can be lowered with reduced feeder length. Moreover, reduced feeder loss results in increased gain of 3 to 5 dB and thus results in improved system coverage by about 20%. In this way, the coverage capabilities of the traditional macro BTS can be achieved at lower transmit power at the Top Of Cabinet (TOC). Thanks to the Remote Radio Unit, the DBS3900 supports distributed installation of baseband and RF modules, which provides ideal coverage solutions in urban and rural areas. The DBS3900 can also be used to provide coverage along highways, and railways. With several RF modules sharing one cell, the inter-cell handover can be reduced to improve the network QoS.

Broadband Service and Enhanced User Experience

With the greatly enhanced baseband processing capability and internal bandwidth, the DBS3900 can support the MCS-9 services at all timeslot levels on the air interface. The IP transmission on the Abis interface helps improve the transmission resource utilization. With the transmission bandwidth substantially optimized, improved user experience is guaranteed.

Low Power Consumption and Energy-Saving

As a result of the advanced hardware designs, for example, Multi Carrier Power Amplifier (MCPA), as well as a series of software power saving technologies such as intelligent PA management, the power consumption of the DBS3900 is greatly reduced, which makes it possible to be powered by the green energy such as the solar energy, wind energy, and methane. Meanwhile the natural heat dissipation design enables the RF module to operate without fans, which further helps reduce power consumption without generating noise or fan-related faults. All these features contribute in constructing an environment friendly network for the operators.

Smooth Evolution and Reduced CAPEX

The DBS3900 supports smooth evolution to EDGE+. During the evolution, most of the hardware can be reused. In addition, the DBS3900 can share the baseband control unit with the UMTS NodeB. In this way, the operators can reduce the CAPEX.

2 Architecture

2.1 Overview

Based on the advanced concept of distributed installation, the DBS3900 adopts a modular design, consisting of two types of basic functional modules, namely the Baseband Processing Unit (BBU3900) and the Remote Radio Unit (RRU). The BBU3900 and the RRU are connected through the Common Public Radio Interface (CPRI) ports and optical cables for signal transmission, realizing the distributed installation for modules.

As against the centralized installation mode, adopted by traditional BTS, the DBS3900 ushers in a new installation mode under which the installation positions of the functional modules are no longer subject to the cabinet. Due to the installation flexibility, the DBS3900 can effectively address the operators' need of quick site acquisition and network construction.

2.2 BBU3900

The BBU3900, a baseband control unit, is responsible for the interaction between the BTS and the BSC. The BBU3900 performs the following functions:

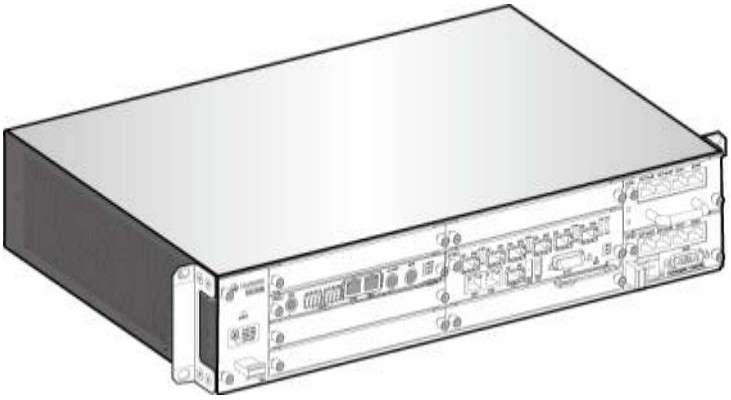
- Signal interaction between the BTS and the BSC
- Provides the system clock
- Manages the entire BTS system in terms of Operation and Maintenance (OM) and signaling processing
- Provides an OM channel connected to the Local Maintenance Terminal (LMT) or M2000

The BBU3900 modules can be installed in stack mode to achieve a higher processing capability.

2.2.1 Appearance of the BBU3900

The BBU3900, with a compact case structure, occupies a 19-inch-wide and 2-U-high space. It can be installed on the wall, on the staircase, or in the storeroom, or even in a cabinet, in the existing network. Figure 2-1 shows the appearance of the BBU3900.

Figure 2-1 Appearance of the BBU3900



The following boards and modules are mandatory for the BBU3900:

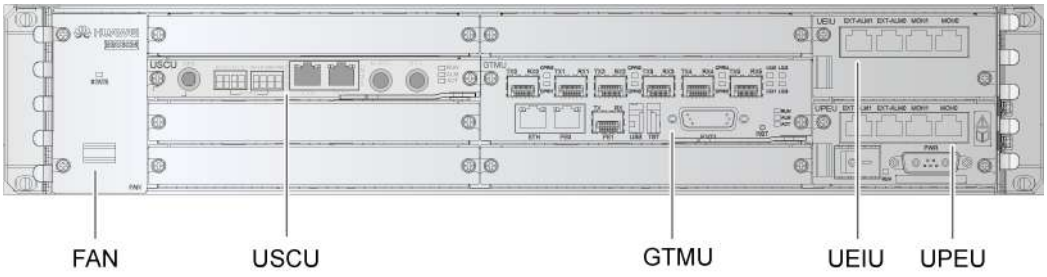
- GTMU: the main control board
- FAN: the FAN unit
- UPEU: Power module

The following boards and module are optional for the BBU3900:

- USCU: the Universal Satellite Card and Clock Unit
- UEIU: the Universal Environment Interface Unit

Figure 2-2 shows the panel of the BBU3900.

Figure 2-2 Panel of the BBU3900



2.2.2 Ports on the BBU3900

Table 2-1 Ports on the mandatory boards of the BBU3900

Board	Port	Specification	Function
GTMU	CPRI	For communication with the RF module (6 ports)	• Provides a reference clock • Controls and manages the entire BTS system
	E1/T1	Supporting four E1s/T1s	
	ETH	For local maintenance and commissioning	

Board	Port	Specification	Function
	FE0	Electrical port for IP transport over the Abis interface	
	FE1	Optical port for IP transport over the Abis interface	
	TST	For testing the clock	
	USB	Reserved port	
UPEU	PWR	Power supply port	• Converts the –48 V DC or +24 V DC input power to +12 V DC power • Provides alarm ports and receives monitoring signals from environment monitoring devices and transmits alarm signals to the main control board
	MON0	Supporting one RS485 signal	
	MON1	Supporting one RS485 signal	
	EXT-ALM0	Supporting four dry contact alarm signals	
	EXT-ALM1	Supporting four dry contact alarm signals	

Table 2-2 Ports on the optional boards of the BBU3900

Board	Port	Specification	Function
UEIU	MON0	Supporting one RS485 signal	Provides alarm ports and receives monitoring signals from environment monitoring devices and transmits alarm signals to the main control board
	MON1	Supporting one RS485 signal	
	EXT-ALM0	Supporting four dry contact alarms	
	EXT-ALM1	Supporting four dry contact alarms	
USCU	GPS	Used for receiving GPS signals	Provides absolute timing information and the 1 Pulse Per Second (PPS) reference clock signal for the main control board, and provides the RGPS ports and BITS port
	RGPS	Used for receiving RGPS signals	
	TOD0	Used for receiving or transmitting 1PPS+TOD signals	
	TOD1	Used for receiving or transmitting 1PPS+TOD signals, and receiving TOD signals from the M1000	
	BITS	Used for receiving BITS clock signals, supporting adaptive input of 2.048 MHz and 10 MHz clock reference source	
	M-1PPS	Used for receiving 1PPS signals from the M1000	

2.3 RRU

The RRU performs the following functions:

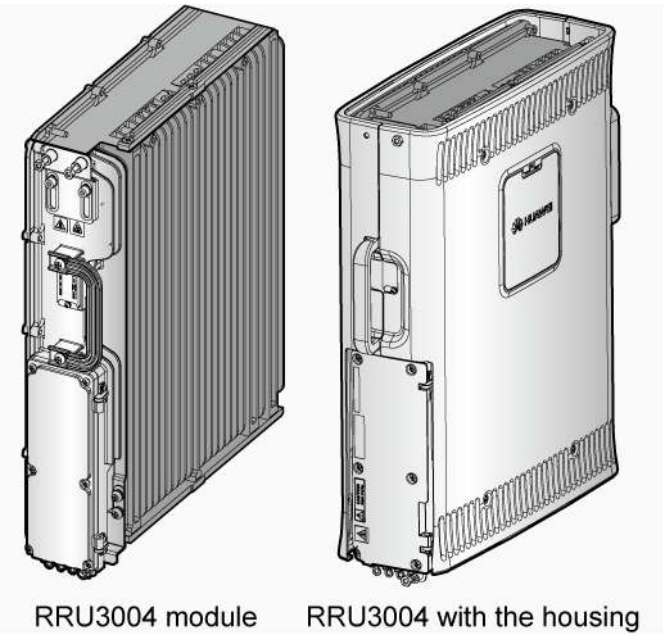
- Modulation and demodulation between baseband signals and RF signals
- Data processing
- Signal combination and division

The RRU is classified into two types, namely RRU3004 and RRU3008. Each RRU3004 module supports up to two carriers, and each RRU3008 module supports up to eight carriers. The modular design enables operators to flexibly combine different modules according to the actual capacity and coverage requirements. Quick capacity expansion can be achieved through the cascading of RRUs.

2.3.1 Appearance of the RRU3004

The RRU3004, a remote radio unit designed on the basis of double-transceiver technology, is mainly used in small or medium-capacity sites. Figure 2-3 shows the appearance of the RRU3004.

Figure 2-3 Appearance of the RRU3004



2.3.2 Ports on the RRU3004

Table 2-3 describes the ports on the RRU3004.

Table 2-3 Ports on the RRU3004

Port	Specification
ANT_TX/RXA	Antenna ports for connection with the antenna system
ANT_TX/RXB	
MON/EXT_ALM	Alarm port
RET	Port for the Remote Electrical Tilt (RET) antenna
TX RX CPRI_E	Eastward optical/electrical port
TX RX CPRI_W	Westward optical/electrical port

Table 2-4 describes the buttons and wiring terminals of the RRU3004.

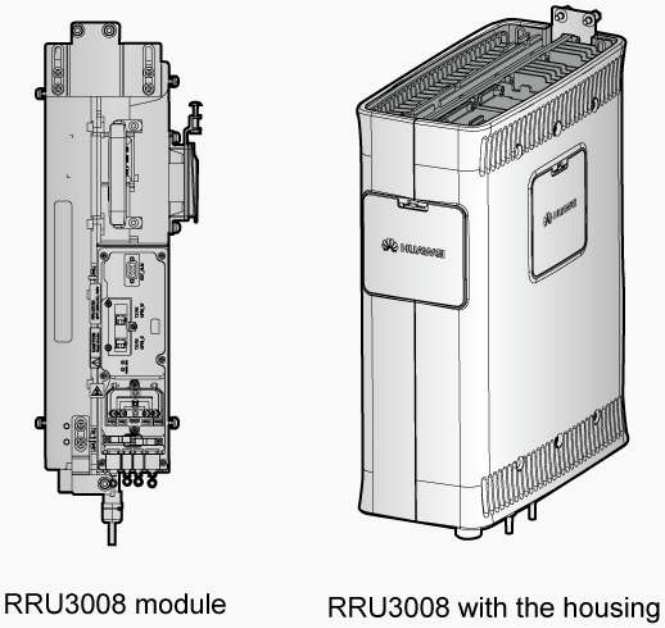
Table 2-4 Buttons and wiring terminals of the RRU3004

Silkscreen on the Panel	Description
RST	Button for resetting the RRU3004
TST VSWR	Button for starting a VSWR test
TST CPRI	Button for the CPRI port test
RTN+	Power supply wiring terminals
NEG-	

2.3.3 Appearance of the RRU3008

The RRU3008, a remote radio unit designed on the basis of multi-carrier technology, is mainly used in large-capacity sites. Figure 2-4 shows the appearance of the RRU3008.

Figure 2-4 Appearance of the RRU3008



2.3.4 Ports on the RRU3008

Table 2-5 describes the ports on the RRU3008.

Table 2-5 Ports on the RRU3008

Port	Specification
ANT_TX/RXA	Antenna ports for connection with the antenna system
ANT_TX/RXB	
EXT_ALM	Alarm port
RET	Port for the RET antenna
TX RX CPRI_E	Eastward optical/electrical port
TX RX CPRI_W	Westward optical/electrical port

Table 2-6 describes the buttons and wiring terminals of the RRU3008.

Table 2-6 Buttons and wiring terminals of the RRU3008

Silkscreen on the Panel	Description
RST	Button for resetting the RRU3008
VSWR	Button for starting a VSWR test

RTN+	Power supply wiring terminals
NEG-	

2.4 Auxiliary Devices

To meet the customer requirements of backup power or installation space for transmission devices, Huawei provides suitable auxiliary devices. The auxiliary devices provided by Huawei for the DBS3900 are the Advanced Power Module (APM30H), Intergrated Battery Backup System (IBBS200D/IBBS200T), and Transmission Cabinet (TMC11H). Characterized by the compact structure and stackable design, the APM30H, TMC11H, and IBBS200D/IBBS200T are easy to transport and applicable to outdoor installation scenarios.

2.4.1 APM30H

The APM30H provides –48 V DC power for the distributed BTS. In addition, it provides installation space for the BBU3900 and other user equipment. The APM30H cabinet, whose heat dissipation is based on the heat exchanger, and two fans for inner and outer air circulation, can be used in areas with poor air quality. The APM30H has a compact design. Figure 2-5 shows the internal structure of the APM30H.

Figure 2-5 Internal structure of the APM30H

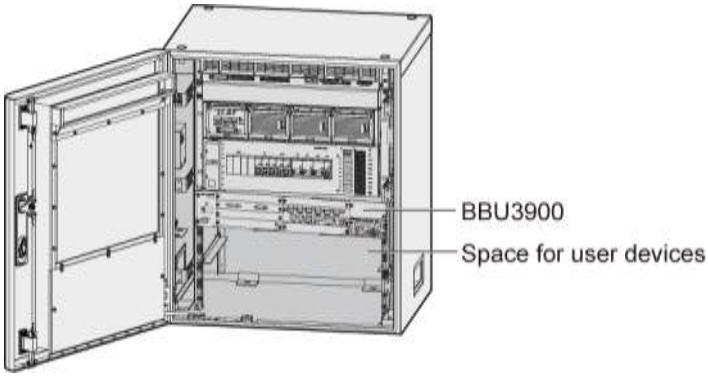


Table 2-7 Technical specifications of the APM30H

Item		Specification
Engineering specifications	Dimensions (height x width x depth)	700 mm × 600 mm × 480 mm (without the base)
	Weight	76.5 kg (without user equipment)
	Working temperature	–40ºC to +50ºC When the ambient temperature is lower than –20°C, an AC heater is required.
	Relative humidity	5% RH to 100% RH
AC input	Input voltage	176 V AC to 290 V AC

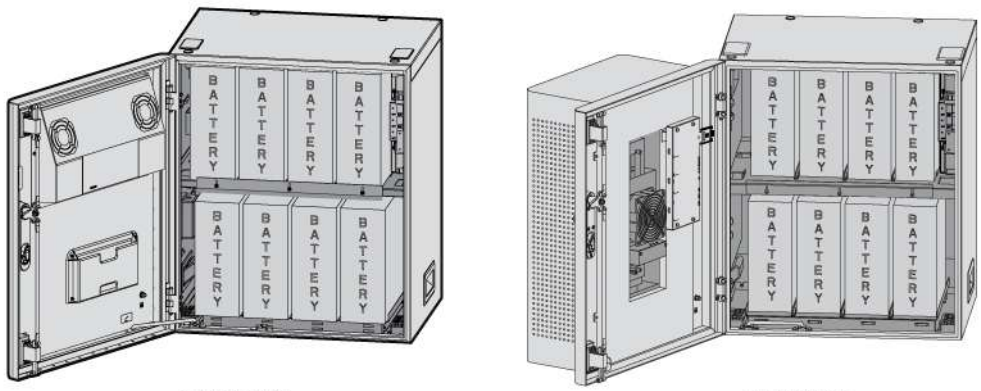
Item		Specification
	Frequency of input voltage	50 Hz/60 Hz
DC output	Output voltage	–48 V DC
	DC output	20 A: 6 outputs 12 A: 2 outputs 4 A: 2 outputs
Space for user equipment	Without the AC heat exchanger	Providing 7 U space for installation
	With the AC heat exchanger	Providing 6 U space for installation

2.4.2 IBBS200D/IBBS200T

The IBBS200D/IBBS200T is installed if long-time power backup is required. Small sized and easy to transport, the IBBS200D/IBBS200T can be applied outdoors. The IBBS200D works in direct-ventilation mode to dissipate heat. The cooler is installed on the inner side of the IBBS200T cabinet door, enabling the IBBS200T to adapt to high ambient temperature.

The IBBS200D/IBBS200T provides a maximum of –48 V 184 Ah DC backup power through the built-in batteries. Figure 2-6 shows the internal structure of the IBBS200D/IBBS200T.

Figure 2-6 Internal structure of the IBBS200D/IBBS200T

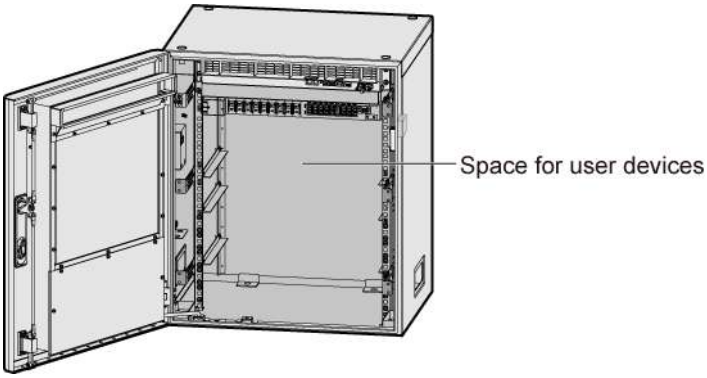


2.4.3 TMC11H

The TMC11H is installed if additional transmission space is required. Small sized and easy to transport, the TMC11H can be installed outdoors, and it dissipates heat based on the heat exchanger system and two air circulation fans. The BBU3900 can be installed in the TMC11H.

The TMC11H provides a space of 11 U for installing user devices. Figure 2-7 shows the internal structure of the TMC11H.

Figure 2-7 Internal structure of the TMC11H



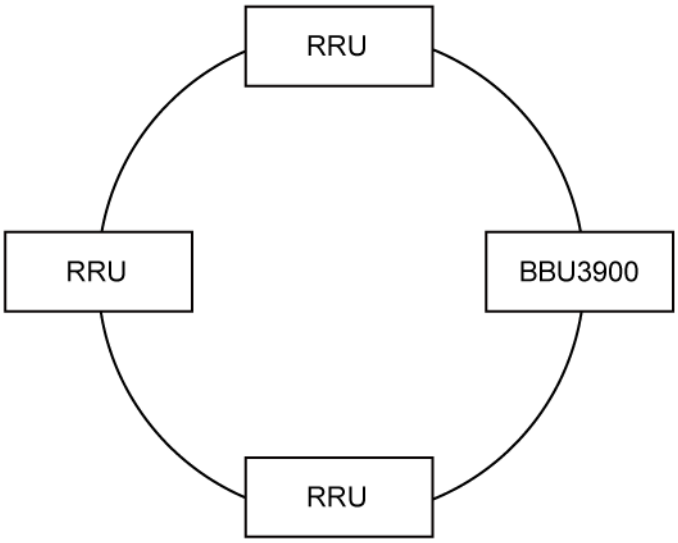
2.5 Reliability

2.5.1 System Reliability

The following factors contribute to the system reliability of the BBU3900 and RRU:

- The RRU supports soft reset. In a chain topology, the reset of an upper-level RRU does not affect the lower-level RRU, when the reset is caused by reasons other than power-off. This technology improves the reliability.
- The BBU3900 and RRUs can also form a ring topology. When a unidirectional or bidirectional fault occurs in any node of the ring, the other RRUs are not affected as they support automatic switchover in the ring topology. This enhances system reliability. Figure 2-8 shows the ring topology of BBU3900 and RRUs.

Figure 2-8 Ring topology of the BBU3900 and RRUs



2.5.2 Hardware Reliability

Hardware Reliability of the BBU3900

The following features of the BBU3900 enhances its hardware reliability:

- The BBU3900 is equipped with built-in fans in N+1 redundancy. It can automatically adjust the fan speed, and the heat dissipation of the system is guaranteed. This helps reduce the noise generated by the fans and minimize fan abrasion, thus improving the life span and reliability of the heat dissipation system. In addition, the BBU3900 can control the start/shutdown of the fan and report alarms in case of fan failures.
- When one of the fans in the BBU3900 is faulty, the DBS3900 can keep operational if the system temperature is lowered by 10°C.
- The power supply module prevents the BBU3900 from the damage caused by power surge.
- The BBU3900 provides protection from overheating.
- The optical modules of the BBU3900 are hot swappable and easily maintainable.
- The BBU3900 allows environment check and can report related alarms.
- The power input port on the BBU3900 is capable of preventing incorrect insertion and reverse insertion.

Hardware Reliability of the RRU

- Reliable power supply design

  In DC power input, the RRU can operate within the range from -36 V DC to -57 V DC, which means that the system can work normally even when the peak input voltage reaches -57 V DC.
- Protection from Overheating

  When the internal temperature of the RRU is too high due to ambient factors, the system automatically reduces power or shuts down the PA for protection, depending on the

severity. When the ambient temperature is restored, the system automatically disables this protection function.

2.5.3 Software Reliability

The DBS3900 software has a very high error tolerance. The whole system does not break down even if the software fails. This means that the system has a self-healing capability. The following describes the error tolerance of the BBU3900 and RRU softwares.

- Regular Check on Key Resources

Seizure check is conducted on various software resources in the system. If the software failure occurred, the check mechanism can ensure the release of suspended resources and the output of the related logs, and alarms.

- Parameter Check

Software performs the validity check on all parameters contained in the LMT/OMC commands. The validity of the data in the data configuration file is also checked when the system is started. This ensures normal operation of the system. When the software is active, all possible software or hardware faults are monitored. Task status and system abnormalities can also be monitored.

- Software Failure Protection

Locally, the base station saves two software release and data release versions. If a fault occurs during the software upgrade, the system automatically rolls back to the previous version. The rollback function makes it possible to avoid the on-site fault handling caused by software downloading.

- Data Check

In terms of data check, the system performs the following functions:

- Checking data consistency on a regular or event-triggered basis
- Restoring data consistency selectively or preferably
- Generating related logs and alarms
- Saving Operation Log Information

The system records user operations on a regular basis and saves the information as operation logs. The operation logs help users locate problems and restore data.

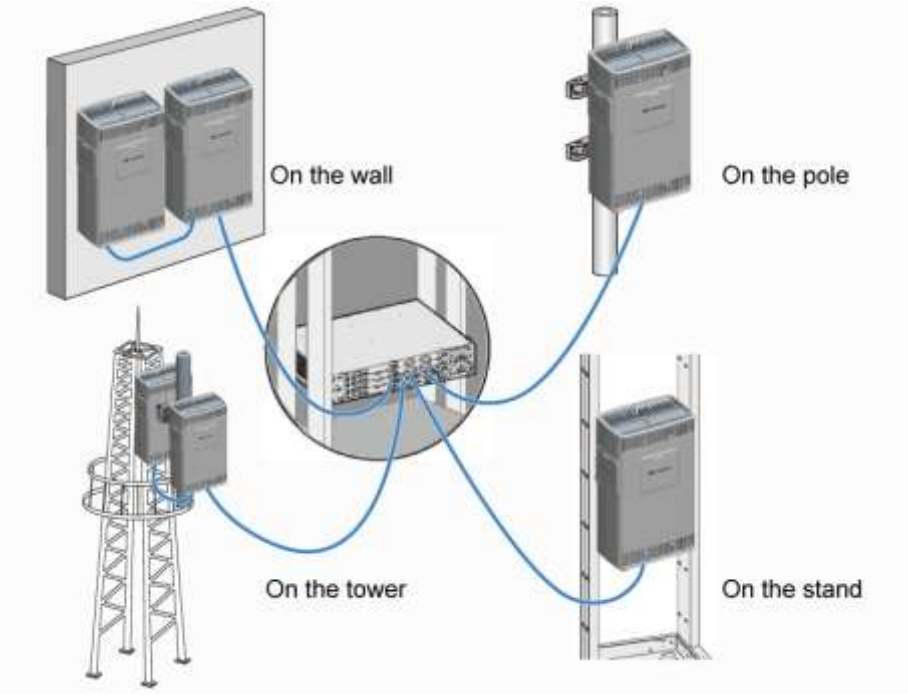
3 Application Scenarios

3.1 Typical Installation Scenarios of the DBS3900

With the increase of the demand for environmental protection and lease cost, new site construction has become increasingly difficult. The DBS3900 developed by Huawei features high integration, easy installation, and low environmental requirements. All these features can facilitate site acquisition and co-siting with the existing site. The BBU3900 features compact design and caters for flexible installation mode. The RRU supports up to six levels of cascading way. One RRU module can be placed at most 40 km away from the BBU3900.

Figure 3-1 shows the typical installation scenarios of the DBS3900.

Figure 3-1 Typical installation scenarios of the DBS3900



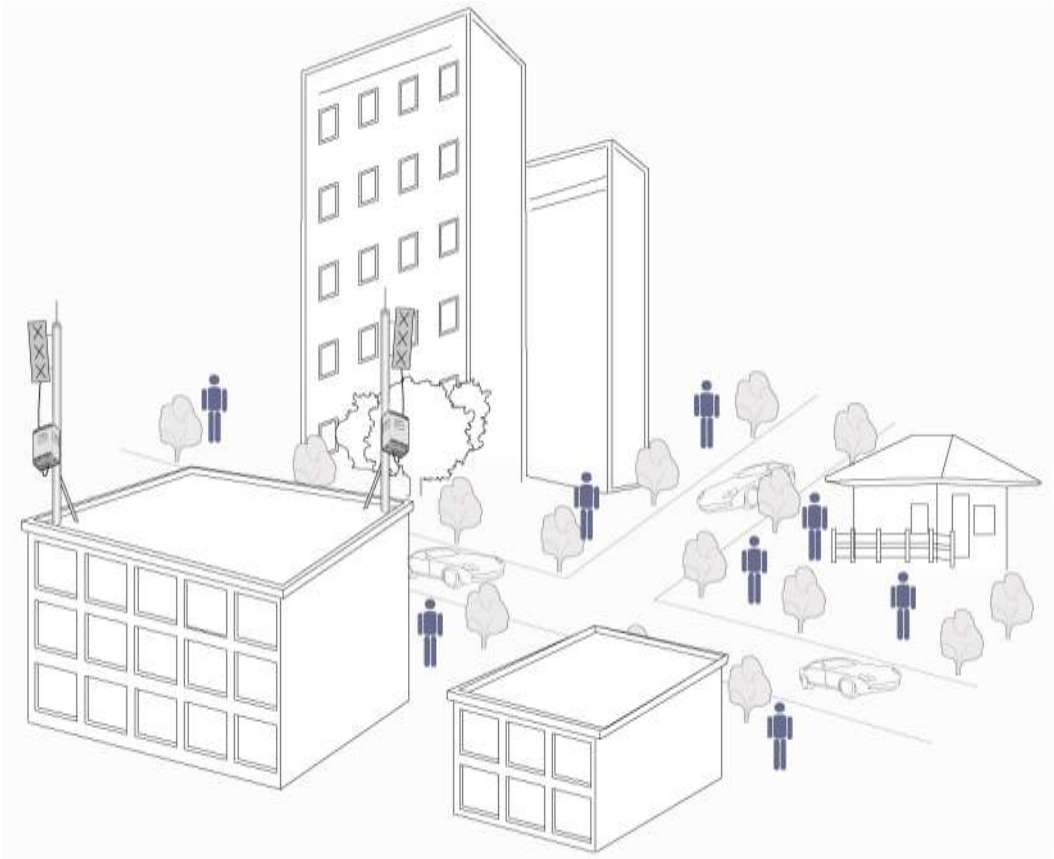
3.2 Applications of the DBS3900

Characterized by the flexible installation, natural heat dissipation, mute operation, and quick site deployment, the DBS3900 can provide solutions for coverage in scenarios such as in urban and rural areas, in buildings, or along highways, and railways.

Coverage in Urban Areas

Difficult site acquisition and high lease cost are major concerns for the operators during site deployment in urban areas. The distributed installation mode of the DBS3900, however, can fully address the concerns of site acquisition. Figure 3-2 shows the typical application scenario of the coverage in urban areas.

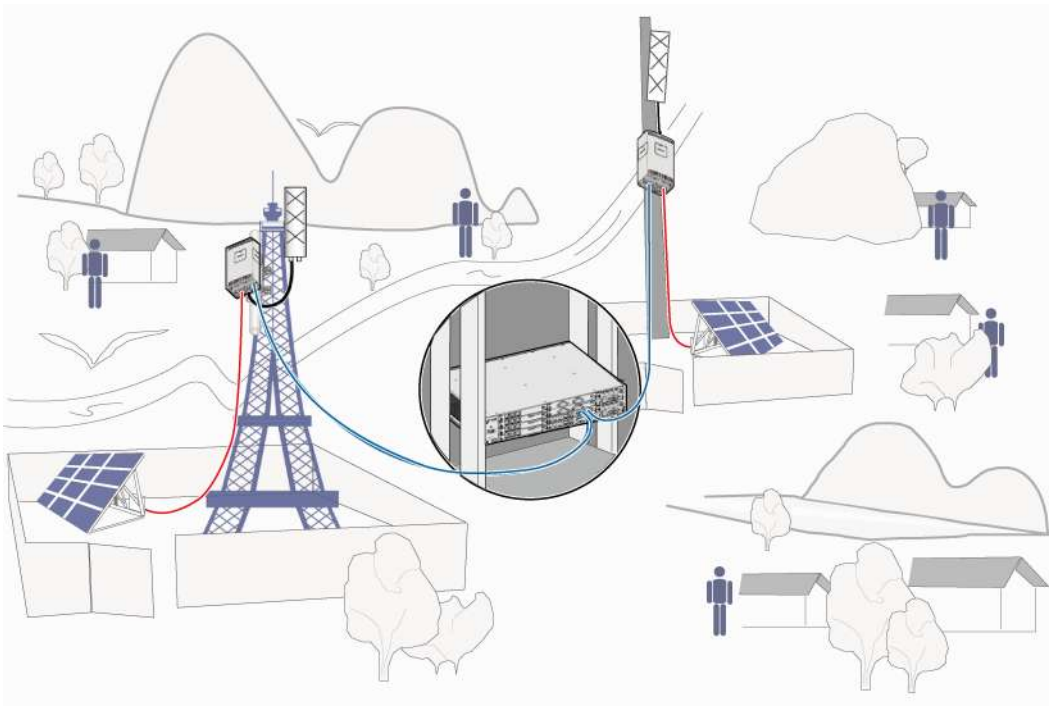
Figure 3-2 Coverage in urban areas



Coverage in Rural Areas

The DBS3900 can provide the wide coverage in rural areas where site acquisition is always quite difficult. Characterized by low power consumption and low feeder losses with the RF module installed near the antenna, the DBS3900 is quite energy-efficient and can be powered by green energy such as solar energy, wind energy, and methane. Figure 3-3 shows the typical application scenario of the coverage in rural areas.

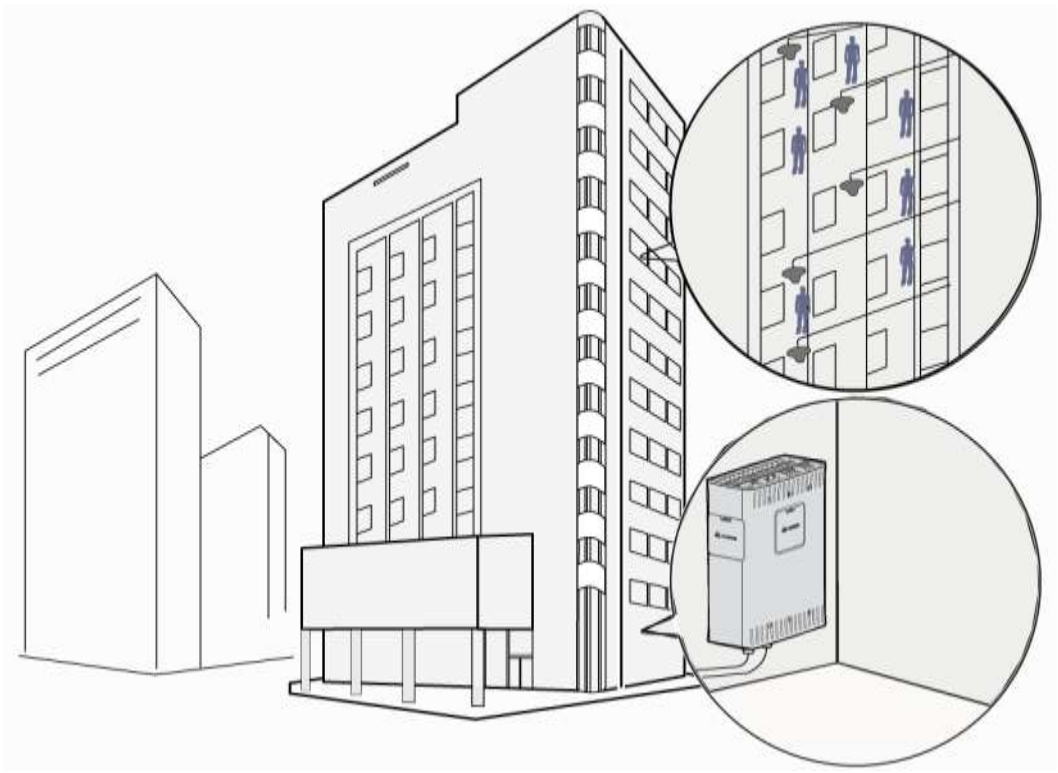
Figure 3-3 Coverage in rural areas



Indoor Coverage in Buildings

Owing to the small footprint and quick site deployment feature, DBS3900 provide ideal indoor coverage solution. Figure 3-4 shows the typical application scenario of the in-building coverage.

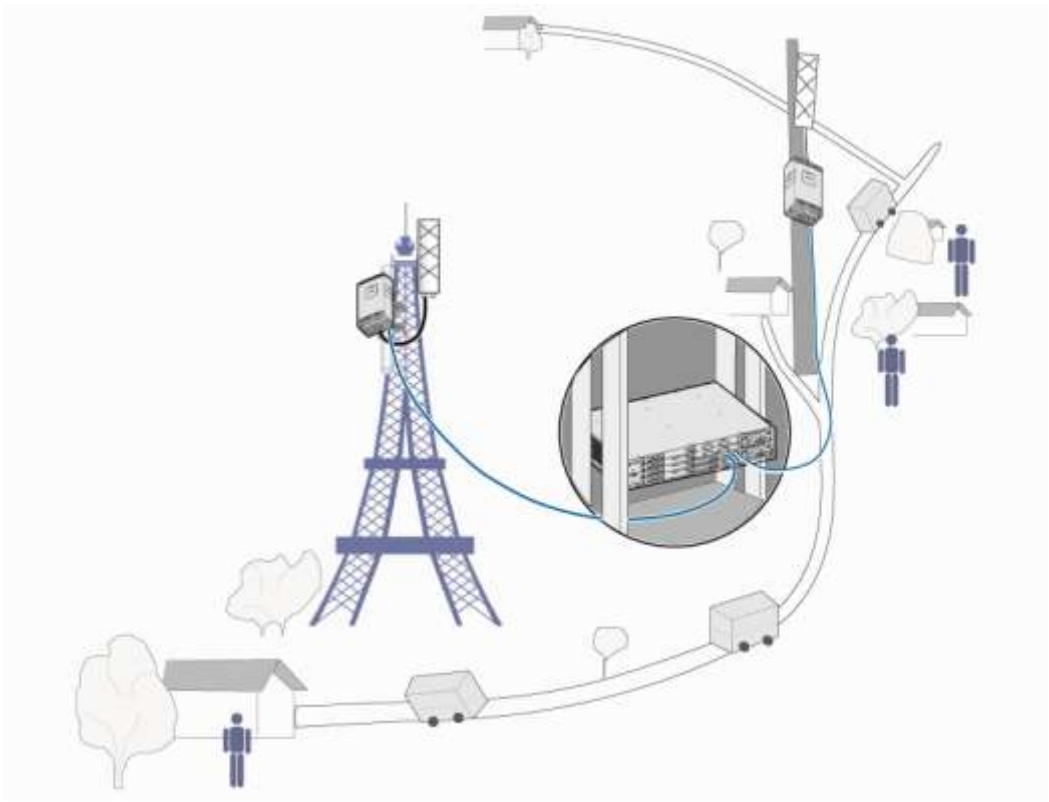
Figure 3-4 Indoor application scenario



Coverage Along Railways and Highways

With several RRUs sharing one cell, the DBS3900 minimizes or helps to reduce inter-cell handovers. This can ensure the QoS for users during high-speed movement, and provides an ideal solution for the user moving at high speed such as railway, or subways. Figure 3-5 shows the typical application scenario of the coverage along railways and highways.

Figure 3-5 Coverage along railways and highways



4 Technical Specification

4.1 RF Specification

Table 4-1 RF Specification of RRU3004

Item	Specification		
Supported frequency band	Frequency band	RX band (MHz)	TX band (MHz)
	EGSM 900 MHz	880–915	925–960
	PGSM 900 MHz	890–915	935–960
	GSM 1800 MHz	1,710–1,785	1,805–1,880
Capacity	Up to 24 carriers per cell; up to 36 carriers per site Maximum configuration: S12/12/12		
Output power	900 MHz (GMSK/8PSK) • Non-combination: 30 W/20 W • Combination: 15 W/10 W • PBT: 40 W/25 W	1800 MHz (GMSK/8PSK) • Non-combination: 20 W/15 W • Combination: 10 W/7.5 W • PBT: 30 W/20 W	
Receiver sensitivity	RX independency	2-way RX diversity	
	–113 dBm	–116 dBm	

Table 4-2 RF Specification of RRU3008

Item	Specification		
Supported frequency band	Frequency band	RX band (MHz)	TX band (MHz)
	GSM 900 MHz	880–905	925–950
		880–915	925–960
		890–915	935–960
	GSM 850 MHz	824–849	869–894
	GSM 1800 MHz	1,710–1,755	1,805–1,850
		1,740–1,785	1,835–1,880
	GSM 1900 MHz	1,850–1,890	1,930–1,970
		1,870–1,910	1,950–1,990
Capacity	Up to 24 carriers per cell; up to 72 carriers per site Maximum configuration: S24/24/24		
Output power	900 MHz/850 MHz/1800 MHz/1900 MHz (GMSK/8PSK)		
	With power sharing: • 3 TRX: 20 W/13 W • 4 TRX: 20 W/13 W • 5 TRX: 12 W/8 W • 6 TRX: 12 W/8 W • 7 TRX: 8 W/5.3 W • 8 TRX: 7 W/4.6 W	Without power sharing: • 3 TRX: 20 W/13 W • 4 TRX: 15 W/10 W • 5 TRX: 12 W/8 W • 6 TRX: 10 W/6.6 W • 7 TRX: 7 W/4.6 W • 8 TRX: 5.5 W/3.6 W	
Receiver sensitivity	RX independency	2-way RX diversity	
	–113 dBm	–116 dBm	
RF standard	3GPP TS 45.005 V8.2.0 multicarrier BTS class 2 requirement		

4.2 Input Power

Table 4-3 Input Power

Item	Specification	
Input power	BBU3900	• –48 V DC, voltage range: –38.4 V DC to –57 V DC • +24 V DC, voltage range: +21.6 V DC to +29 V DC
	RRU	–48 V DC, voltage range: –36 V DC to –57 V DC

4.3 Power Consumption

Table 4-4 Power Consumption (RRU3004)

Item	Specification	
Power consumption	Configuration	Typical value (W)
	S2/2/2, 900 MHz, TOC=30 W	500
	S2/2/2, 1800 MHz, TOC=20 W	500

Table 4-5 Power Consumption (RRU3008)

Item	Specification	
Power consumption	RRU3008	Typical value (W)
	S4/4/4, 900 MHz/850 MHz, TOC=20 W	730
	S6/6/6, 900 MHz/850 MHz, TOC=12 W	730
	S4/4/4, 1,800 MHz/1,900 MHz, TOC=20 W	730
	S6/6/6, 1,800 MHz/1,900 MHz, TOC=12 W	730

NOTE

The typical power consumption is measured with a 30% load.

4.4 Specification of the Equipment

Table 4-6 Specification of the Equipment

Item	Specification			
Transmission port	4 E1s/T1s, 2 FE ports (an electrical port and an optical port)			
Dimensions	Item	Height (mm)	Width (mm)	Depth (mm)
	BBU3900	86	442	310
	RRU3004	480	356	100
	RRU3004 (with the housing)	485	380	130
	RRU3008	480	356	140
	RRU3008 (with the housing)	485	380	170
Weight	BBU3900	7 kg (typical); 12 kg (maximum)		
	RRU3004	15 kg (without the housing); 17 kg (with the housing)		
	RRU3008	21 kg (without the housing); 23 kg (with the housing)		

4.5 Environment Specification

Table 4-7 Environment Specification

Item	Specification
Temperature	• BBU3900: –20°C to +55°C • RRU (without solar radiation): –40°C to +50°C • RRU (with solar radiation): –40°C to +45°C
Relative humidity	BBU3900: 5% RH to 95% RH
	RRU: 5% RH to 100% RH
Air pressure	70 kPa to 106 kPa
Protection degree	BBU3900: IP20 RRU: IP65
Anti-seismic performance	BBU3900: IEC 60068-2-57 (1999-11) RRU: NEBS GR63 zone4
RET antenna	In compliance with the AISG1.1 protocol
Storage environment	ETSI EN 300019-1-1 V2.1.4 (2003-04) Class 1.2: “Weather protected, not temperature-controlled storage locations”
Transportation environment	ETSI EN 300019-1-2 V2.1.4 (2003-04) Class 2.3: "Public transportation"
Operating environment	BBU3900 in compliance with : ETSI EN 300019-1-3 V2.2.2 (2004-07) Class 3.1: "Temperature-controlled locations"
	RRU in compliance with: • 3G TS25.141 V3.0.0 • ETSI EN 300019-1-4 V2.1.2 (2003-04) Class 4.1: “Non-weatherprotected locations”
EMC	The DBS3900 meets the EMC requirements and complies with the following standards: • R&TTE Directive 99/5/EC • 3GPP TS 25.113 V4.4.0 (2002-12) • ETSI EN 301 489-1 V1.5.1 (2004-11) • ETSI EN 301 908-1 V2.2.1 (2003-10) • ITU-T SM 329-10(2003) • FCC PART15
Availability	RRU3004: ≥ 99.9991%; RRU3008: ≥ 99.999%
MTBF	RRU3004: 108,000 hours; RRU3008: 100,000 hours
MTTR	≤ 1 hour

5 Abbreviations

Abbreviation	Expansion
APM	Advanced Power Module
BBU	Baseband Unit
CAPEX	Capital Expenditure
CPRI	Common Public Radio Interface
GTMU	GSM Transmission & Timing & Management Unit for BBU
IBBS	Intergrated Battery Backup System
LTE	Long Term Evolution
MTBF	Mean Time Between Failures
MTTR	Mean Time to Recovery
OPEX	Operation Expenditure
RRU	Radio Remote Unit
TMC	Transmission Cabinet
TOC	Transmit Power at the Top of Cabinet
UEIU	Universal Environment Interface Unit
UPEU	Universal Power and Environment Interface Unit
USCU	Universal Satellite Card and Clock Unit