

AAU3940 Description

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Contents

1 Overview.....1

1.1 Appearance 3

1.2 Physical Ports 4

2 Technical Specifications6

2.1 Frequency Band 6

2.2 Electrical Specifications 7

2.3 EIRP 7

2.4 EIRS 8

2.5 Capacity 9

2.6 Typical Output Power 10

2.7 Power Consumption..... 14

2.8 Input Power..... 15

2.9 Equipment Specifications 15

2.10 Accessory 15

2.11 CPRI Port Specifications 16

2.12 Environmental Specifications 16

3 Acronyms and Abbreviations18

1 Overview

With the rapid development of mobile broadband (MBB), there are increasingly requirements for capacity expansion in densely populated urban areas. Adding sites becomes an inevitable method to meet coverage and capacity requirements. However, adding traditional macro base stations require high costs and long periods, and operators require a time- and cost-effective network deployment solution. Therefore, Huawei introduces light base stations.

Compared with traditional macro base stations, light base stations feature small size, light weight, and environment integration that enables the light base stations to be fast deployed. Light base stations are preferentially selected when base stations need to be added in densely populated urban areas.

The AAU3940, important RF module in light base stations, uses the AAS technology to integrate the functions of antennas and the RF module. In addition, it uses the user-friendly design so that the site can be easily obtained and the AAU3940 can be easily deployed.

The AAU3940 adopts the software-defined frequency technology to support the ultra-wide bandwidth. Power can be allocated to two frequency bands through software setting to flexibly meet operators' different coverage requirements.

The AAU3940 can reduce about 0.8 dB feeder loss by incorporating the functions of RF modules into the antenna and further improves the coverage capability.

The AAU3940 has a beautiful appearance and simplifies site acquisition, which can be installed on a pole along the streets or on the top of a building. Figure 1-1 and Figure 1-2 show the AAU3940 modules installed on a pole along the streets and installed on the top of a building, respectively.

Figure 1-1 AAU3940 modules installed on a pole along the streets



Figure 1-2 AAU3940 modules installed on the top of a building

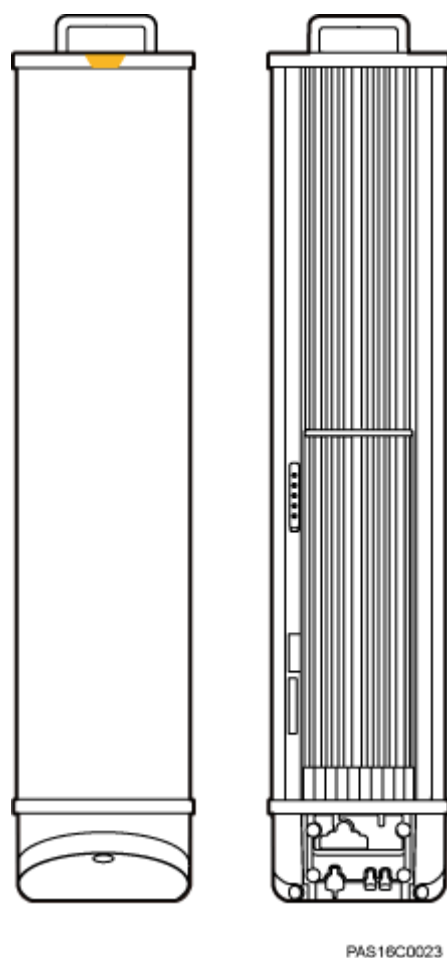


Figure 1-3 AAU3940 modules installed on a wall



1.1 Appearance

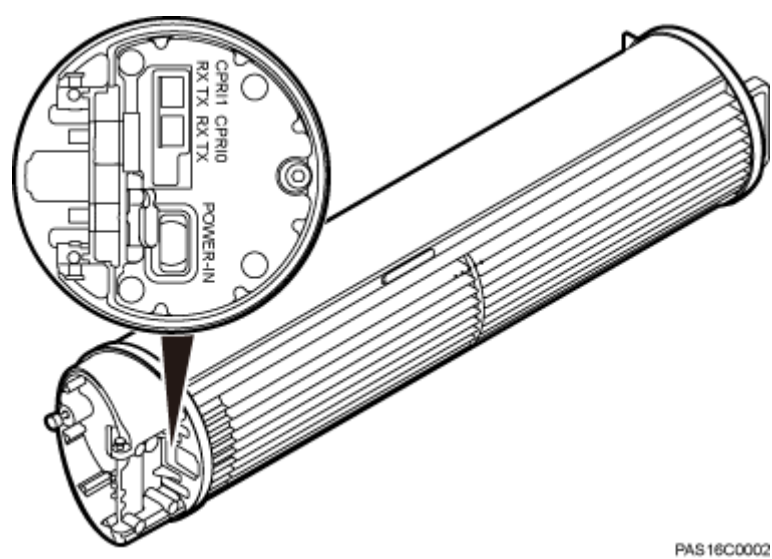
Figure 1-4 shows the appearance of the AAU3940.

Figure 1-4 Appearance of the AAU3940

1.2 Physical Ports

Figure 1-5 shows the physical ports on the AAU3940 and Table 1-1 describes these ports.

Figure 1-5 Physical ports on the AAU3940



PAS16C0002

Table 1-1 Physical ports on the AAU3940

Port	Connector	Quantity	Description
CPRI port	DLC	2	Connects to the baseband unit (BBU).
Power supply port	<ul style="list-style-type: none">AC AAU: tool-less male connector (pressfit type)DC AAU: EPC4 connector	1	Supplies power to the AAU.

2 Technical Specifications

2.1 Frequency Band

Table 2-1 Frequency bands of the AAU3940

AAU Type	Frequency Band (MHz)	RX Frequency Band (MHz)	TX Frequency Band (MHz)	IBW (MHz)
AAU3940 (1800~2100MHz) (AC/DC)	1800	1710 to 1785	1805 to 1880	40
	2100	1920 to 1980	2110 to 2170	40
AAU3940 (AWS~PCS) (DC)	AWS	1710 to 1755	2110 to 2155	40
	PCS	1850 to 1910	1930 to 1990	40



NOTE

When the AAU3940 (AWS~PCS) is configured with both carriers on the PCS frequency band and carriers on the AWS frequency band, the configuration scenario where the third-order intermodulated signal falls in the receive frequency range may occur under certain spectrum combinations, which deteriorates the AAU performance and consequently the AAU3940 cannot work properly. Ensure that spectrum combinations will not result in such a configuration scenario before configuring carriers for the AAU3940.

2.2 Electrical Specifications

Table 2-2 Electrical specifications of the AAU3940 (1800~2100 MHz)

Frequency range (MHz)	1710~1880	1920~2170
Polarization	+45°, -45°	
Electrical downtilt (°)	-3~12, continuously adjustable	
Gain (dBi)	14	14.5
Horizontal 3 dB beam width (°)	70	70
Vertical 3 dB beam width (°)	13	12
Front-to-back ratio (dB)	Typ.25	
Grounding	DC grounding	

Table 2-3 Electrical specifications of the AAU3940 (AWS~PCS)

Frequency range (MHz)	1710~1910	1930~2155
Polarization	+45°, -45°	
Electrical downtilt (°)	-3~12, continuously adjustable	
Gain (dBi)	14	14.5
Horizontal 3 dB beam width (°)	70	70
Vertical 3 dB beam width (°)	13	12
Front-to-back ratio (dB)	Typ.25	
Grounding	DC grounding	

2.3 EIRP

Table 2-4 EIRP of the AAU3940

AAU Type	Frequency Band	EIRP
AAU3940 (1800~2100 MHz)	1800 MHz	2 x (30 W + 14 dBi) = 2 x 58.8 dBm
		2 x (40 W + 14 dBi) = 2 x 60.0 dBm

AAU Type	Frequency Band	EIRP
AAU3940 (AWS~PCS)	2100 MHz	2 x (30 W + 14.5 dBi) = 2 x 59.3 dBm
		2 x (40 W + 14.5 dBi) = 2 x 60.5 dBm
	AWS	2 x (30 W + 14.5 dBi) = 2 x 59.3 dBm
		2 x (40 W + 14.5 dBi) = 2 x 60.5 dBm
	PCS	2 x (30 W + 14.5 dBi) = 2 x 59.3 dBm
		2 x (40 W + 14.5 dBi) = 2 x 60.5 dBm

**NOTE**

When the ambient temperature ranges from -40°C to 50°C , the AAU3940 supports a maximum of 2x30 W output power. When the ambient temperature ranges from -40°C to 40°C , the AAU3940 supports a maximum of 2x40 W output power.

2.4 EIRS

Table 2-5 EIRS of the AAU3940

AAU Type	Mode	Frequency Band (MHz)	EIRS
AAU3940 (1800~2100 MHz)	UMTS	2100	$-125.7\text{ dBm} - 14.5\text{ dBi}$
	LTE	1800	$-106.1\text{ dBm} - 14\text{ dBi}$
		2100	$-106.1\text{ dBm} - 14.5\text{ dBi}$
AAU3940 (AWS~PCS)	UMTS	PCS	$-125.5\text{ dBm} - 14\text{ dBi}$
	LTE	AWS	$-105.9\text{ dBm} - 14\text{ dBi}$
		PCS	$-105.9\text{ dBm} - 14\text{ dBi}$

**NOTE**

- The receiver sensitivity of UMTS, as recommended in 3GPP TS 25.104, is calculated by deducting the antenna gain from the receiver sensitivity measured at the antenna connector on condition that the channel rate reaches 12.2 kbit/s and the bit error rate (BER) does not exceed 0.001.
- The receiver sensitivity of LTE, as recommended in 3GPP TS 36.104, is calculated by deducting the antenna gain from the receiver sensitivity measured at the antenna connector under the condition of a 5 MHz channel bandwidth based on the FRC A1-3 in Annex A.1 (QPSK, $R = 1/3$, 25 RBs) standard.

2.5 Capacity

Table 2-6 Single-mode capacity

Mode	Capacity
UMTS	(Only supported in the 2100 MHz or PCS frequency band) Each AAU3940 (1800~2100 MHz) or each AAU3940 (AWS~PCS) supports: <ul style="list-style-type: none">• 6 carriers without MIMO• 4 carriers with MIMO
LTE	Each AAU3940 (1800~2100 MHz) or each AAU3940 (AWS~PCS) supports two carriers. The LTE bandwidth is 5 MHz, 10 MHz, 15 MHz, or 20 MHz.

Table 2-7 Multimode capacity

Mode	Capacity
UMTS+LTE	For detailed specifications, see Table 2-11, Table 2-12, Table 2-16 and Table 2-17.

2.6 Typical Output Power

NOTE

- If an AAU3940 is located at an altitude of 3500 m to 4500 m, its output power is 1 dB less than the standard output power. If an AAU3940 is located at an altitude of 4500 m to 6000 m, its output power is 2 dB less than the standard output power.
- An AAU3940 working in UMTS, LTE, or MSR mode complies with ETSI EN 301 908 V5.2.1 and 3GPP TS 37.104.
- "NxM W" indicates that the number of TX channels is N and the maximum output power of each TX channel is M W.
- The output power per carrier in the output power tables indicates the maximum output power supported to ensure network performance.
- When two LTE FDD 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.

When the ambient temperature ranges from -40°C to 50°C , the AAU3940 supports a maximum of 2x30 W output power. When the ambient temperature ranges from -40°C to 40°C , the AAU3940 supports a maximum of 2x40 W output power.

Table 2-8 Typical output power of the AAU3940 (2100 MHz, UMTS, 2x30 W) or of the AAU3940 (PCS, UMTS, 2x30 W)

Number of UMTS Carriers	Output Power per UMTS Carrier (W)
1	30
2	30
3	20
4	15
5	10
6	10
1 (MIMO)	2x30
2 (MIMO)	2x15
3 (MIMO)	2x10
4 (MIMO)	2x7.5

Table 2-9 Typical output power of the AAU3940 (1800 MHz/2100 MHz, LTE, 2x30 W) or of the AAU3940 (AWS/PCS, LTE, 2x30 W)

Number of LTE Carriers	Output Power per LTE Carrier (W)	Bandwidth of an LTE Carrier (MHz)
1 (MIMO)	2x30	5, 10, 15, 20
2 (MIMO)	2x15	5, 10, 15, 20

Table 2-10 Typical output power of the AAU3940 (1800 MHz+2100 MHz, LTE, 2x30 W) or of the AAU3940 (AWS+PCS, LTE, 2x30 W)

Number of LTE (1800 MHz/AWS) Carriers	Output Power per LTE (1800 MHz/AWS) Carrier (W)	Bandwidth of an LTE (1800 MHz/AWS) Carrier (MHz)	Number of LTE (2100 MHz/PCS) Carriers	Output Power per LTE (2100 MHz/PCS) Carrier (W)	Bandwidth of an LTE (2100 MHz/PCS) Carrier (MHz)
1 (MIMO)	2x15	5, 10, 15, 20	1 (MIMO)	2x15	5, 10, 15, 20

Table 2-11 Typical output power of the AAU3940 (2100 MHz UMTS+1800 MHz/2100 MHz LTE, 2x30 W) or of the AAU3940 (PCS UMTS+AWS/PCS LTE, 2x30 W)

Number of UMTS Carriers	Output Power per UMTS Carrier (W)	Number of LTE Carriers	Output Power per LTE Carrier (W)	Bandwidth of an LTE Carrier (MHz)
1	15	1 (MIMO)	2x15	5, 10, 15, 20
2	15	1 (MIMO)	2x15	5, 10, 15, 20
3	10	1 (MIMO)	2x10	5, 10, 15, 20
4	10	1 (MIMO)	2x10	5, 10, 15, 20
1	10	2 (MIMO)	2x10	5, 10, 15, 20
2	10	2 (MIMO)	2x10	5, 10, 15, 20
3	7.5	2 (MIMO)	2x7.5	5, 10, 15, 20
4	7.5	2 (MIMO)	2x7.5	5, 10, 15, 20
1 (MIMO)	2x15	1 (MIMO)	2x15	5, 10, 15, 20
2 (MIMO)	2x10	1 (MIMO)	2x10	5, 10, 15, 20
3 (MIMO)	2x7.5	1 (MIMO)	2x7.5	5, 10, 15, 20
1 (MIMO)	2x10	2 (MIMO)	2x10	5, 10, 15, 20
2 (MIMO)	2x7.5	2 (MIMO)	2x7.5	5, 10, 15, 20

Table 2-12 Typical output power of the AAU3940 (1800 MHz LTE+2100 MHz UL MSR, 2x30 W) or of the AAU3940 (AWS LTE+PCS UL MSR, 2x30 W)

Number of UMTS (2100 MHz/PCS) Carriers	Output Power per UMTS (2100 MHz/PCS) Carrier (W)	Number of LTE (2100 MHz/PCS) Carriers	Output Power per LTE (2100 MHz/PCS) Carrier (W)	Bandwidth of an LTE (2100 MHz/PCS) Carrier (MHz)	Number of LTE (1800 MHz/AWS) Carriers	Output Power per LTE (1800 MHz/AWS) Carrier (W)	Bandwidth of an LTE (1800 MHz/AWS) Carrier (MHz)
1	10	1 (MIMO)	2x10	5, 10, 15, 20	1 (MIMO)	2x10	5, 10, 15, 20
2	10	1 (MIMO)	2x10	5, 10, 15, 20	1 (MIMO)	2x10	5, 10, 15, 20
3	7.5	1 (MIMO)	2x7.5	5, 10, 15, 20	1 (MIMO)	2x7.5	5, 10, 15, 20
4	7.5	1 (MIMO)	2x7.5	5, 10, 15, 20	1 (MIMO)	2x7.5	5, 10, 15, 20
1 (MIMO)	2x10	1 (MIMO)	2x10	5, 10, 15, 20	1 (MIMO)	2x10	5, 10, 15, 20
2 (MIMO)	2x7.5	1 (MIMO)	2x7.5	5, 10, 15, 20	1 (MIMO)	2x7.5	5, 10, 15, 20

Table 2-13 Typical output power of the AAU3940 (2100 MHz, UMTS, 2x40 W) or of the AAU3940 (PCS, UMTS, 2x40 W)

Number of UMTS Carriers	Output Power per UMTS Carrier (W)
1	40
2	40
3	20
4	20
5	13
6	13
1 (MIMO)	2x40
2 (MIMO)	2x20
3 (MIMO)	2x13
4 (MIMO)	2x10

Table 2-14 Typical output power of the AAU3940 (1800 MHz/2100 MHz, LTE, 2x40 W) or of the AAU3940 (AWS/PCS, LTE, 2x40 W)

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

Table 2-15 Typical output power of the AAU3940 (1800 MHz+2100 MHz, LTE, 2x40 W) or of the AAU3940 (AWS+PCS, LTE, 2x40 W)

Number of LTE (1800 MHz/AWS) Carriers	Output Power per LTE (1800 MHz/AWS) Carrier (W)	Bandwidth of an LTE (1800 MHz/AWS) Carrier (MHz)	Number of LTE (2100 MHz/PCS) Carriers	Output Power per LTE (2100 MHz/PCS) Carrier (W)	Bandwidth of an LTE (2100 MHz/PCS) Carrier (MHz)
1 (MIMO)	2x20	5, 10, 15, 20	1 (MIMO)	2x20	5, 10, 15, 20

Table 2-16 Typical output power of the AAU3940 (2100 MHz UMTS+1800 MHz/2100 MHz LTE, 2x40 W) or of the AAU3940 (PCS UMTS+AWS/PCS LTE, 2x40 W)

Number of UMTS Carriers	Output Power per UMTS Carrier (W)	Number of LTE Carriers	Output Power per LTE Carrier (W)	Bandwidth of an LTE Carrier (MHz)
1	20	1 (MIMO)	2x20	5, 10, 15, 20
2	20	1 (MIMO)	2x20	5, 10, 15, 20
3	13	1 (MIMO)	2x13	5, 10, 15, 20
4	13	1 (MIMO)	2x13	5, 10, 15, 20
1	13	2 (MIMO)	2x13	5, 10, 15, 20
2	13	2 (MIMO)	2x13	5, 10, 15, 20
3	10	2 (MIMO)	2x10	5, 10, 15, 20
4	10	2 (MIMO)	2x10	5, 10, 15, 20
1 (MIMO)	2x20	1 (MIMO)	2x20	5, 10, 15, 20
2 (MIMO)	2x13	1 (MIMO)	2x13	5, 10, 15, 20
3 (MIMO)	2x10	1 (MIMO)	2x10	5, 10, 15, 20

Number of UMTS Carriers	Output Power per UMTS Carrier (W)	Number of LTE Carriers	Output Power per LTE Carrier (W)	Bandwidth of an LTE Carrier (MHz)
1 (MIMO)	2x13	2 (MIMO)	2x13	5, 10, 15, 20
2 (MIMO)	2x10	2 (MIMO)	2x10	5, 10, 15, 20

Table 2-17 Typical output power of the AAU3940 (1800 MHz LTE+2100 MHz UL MSR, 2x40 W) or of the AAU3940 (AWS LTE+PCS UL MSR, 2x40 W)

Number of UMTS (2100 MHz/P CS) Carriers	Output Power per UMTS (2100 MHz/P CS) Carrier (W)	Number of LTE (2100 MHz/P CS) Carriers	Output Power per LTE (2100 MHz/P CS) Carrier (W)	Bandwidth of an LTE (2100 MHz/P CS) Carrier (MHz)	Number of LTE (1800 MHz/A WS) Carriers	Output Power per LTE (1800 MHz/A WS) Carrier (W)	Bandwidth of an LTE (1800 MHz/A WS) Carrier (MHz)
1	13	1 (MIMO)	2x13	5, 10, 15, 20	1 (MIMO)	2x13	5, 10, 15, 20
2	13	1 (MIMO)	2x13	5, 10, 15, 20	1 (MIMO)	2x13	5, 10, 15, 20
3	10	1 (MIMO)	2x10	5, 10, 15, 20	1 (MIMO)	2x10	5, 10, 15, 20
4	10	1 (MIMO)	2x10	5, 10, 15, 20	1 (MIMO)	2x10	5, 10, 15, 20
1 (MIMO)	2x13	1 (MIMO)	2x13	5, 10, 15, 20	1 (MIMO)	2x13	5, 10, 15, 20
2 (MIMO)	2x10	1 (MIMO)	2x10	5, 10, 15, 20	1 (MIMO)	2x10	5, 10, 15, 20

2.7 Power Consumption

Table 2-18 Power consumption of the AAU3940

AAU Type	Configuration	Output Power per Carrier (W)	Typical Power Consumption (W)	Maximum Power Consumption (W)
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NOTE AAU3940 (1800~2100 MHz) (AC/DC)	LTE: 2 carriers	LTE: 2x20	250	350
	LTE: 2 carriers	LTE: 2x15	210	300
AAU3940 (AWS~PCS) (DC)	LTE: 2 carriers	LTE: 2x20	250	350
	LTE: 2 carriers	LTE: 2x15	210	300

- The typical power consumption and the maximum power consumption are measured when the ambient temperature is 25°C.
- The typical power consumption for LTE is measured when the load is 50%.
- The maximum power consumption for LTE is measured when the load is 100%.

2.8 Input Power

Table 2-19 Input power of the AAU3940

AAU Type	Specifications
AAU3940 (1800~2100 MHz) (AC)	220 V AC single-phase; voltage range: 176 V AC to 290 V AC 110 V AC dual-live-wire; voltage range: 90 V/180 V AC to 135 V/270 V AC
AAU3940 (1800~2100 MHz) (DC)	–48 V DC; voltage range: –36 V DC to –57 V DC
AAU3940 (AWS~PCS) (DC)	–48 V DC; voltage range: –36 V DC to –57 V DC

2.9 Equipment Specifications

Table 2-20 Equipment specifications of the AAU3940

Item	Specifications
Dimensions (diameter x height)	150 mm x 750 mm
Weight	15 kg

2.10 Accessory

Item	Description
Angle adjusting component	Horizontal azimuth: $\pm 30^\circ$

**NOTE**

For details about the angle adjusting component, see *AAU3940 Installation Guide*.

2.11 CPRI Port Specifications

Table 2-21 CPRI port specifications of the AAU3940

Item	Specifications
Number of CPRI ports	2
CPRI data rate	1.25 Gbit/s, 2.5 Gbit/s, 4.9 Gbit/s, or 9.8 Gbit/s
Topology	Star, chain, or dual-star
Cascading level	UL CPRI MUX: 4
Maximum distance from the BBU	<p>The maximum distances of the RRUs from the BBU vary with the types of BBP in LTE mode as follows:</p> <ul style="list-style-type: none"> • LBBPd1/UBBPd3: 20 km • LBBPd2/UBBPd4: 40 km • LBBPd3/UBBPd5/UBBPd6: <ul style="list-style-type: none"> - Number of LTE cells ≤ 3: 40 km - Number of LTE cells > 3: 20 km

2.12 Environmental Specifications

Table 2-22 Environmental specifications of the AAU3940

Item	Specifications
Operating temperature	<ul style="list-style-type: none"> • Without solar radiation: -40°C to $+50^{\circ}\text{C}$ (2x30 W); -40°C to $+40^{\circ}\text{C}$ (2x40 W) • With solar radiation: -40°C to $+45^{\circ}\text{C}$ (2x30 W); -40°C to $+35^{\circ}\text{C}$ (2x40 W)
Wind load (N)	<ul style="list-style-type: none"> • Front: 100 (at a speed of 150 km/h) • Side: 100 (at a speed of 150 km/h) • Rear: 115 (at a speed of 150 km/h)
Operational wind speed (km/h)	150
Maximum wind speed (km/h)	200

Item	Specifications
Relative humidity	5% RH to 100% RH
Absolute humidity	1 g/m ³ to 30 g/m ³
Protection class	IP55
Operating environment	The following standards must be complied with: <ul style="list-style-type: none">• 3GPP TS 25.141• 3GPP TS 36.141• ETSI EN 300019-1-4 V2.1.2 (2003-04) Class 4.1: "Non-weather protected locations."
Shockproof protection	The following standard must be complied with: <ul style="list-style-type: none">• ETSI300019-2-3

3

Acronyms and Abbreviations

Table 3-1 Acronyms and abbreviations

Acronym and Abbreviation	Full Name
AAS	active antenna system
AU	antenna unit
RU	radio unit
3GPP	3rd Generation Partnership Project
BBU	baseband unit
BER	bit error rate
CPRI	common public radio interface
GSM	Global System for Mobile Communications
LTE	Long Term Evolution
MBB	mobile broadband
MIMO	multiple-input multiple-output
MSR	multi-standard radio
PA	power amplifier
RFU	radio frequency unit
RRU	radio remote unit
UMTS	Universal Mobile Telecommunications System
EIRS	equivalent isotropically radiated sensitive
EIRP	equivalent isotropically radiated power