RTN XMC ODU

Hardware Description

Issue	10
Date	2019-10-30

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About This Document

Overview

This document describes the RTN XMC ODU and its components, including hybrid couplers, split mounting parts, antennas, antenna adapters, and cables.

Version

The following table lists the product versions to which the documentation applies.

Product Name	Version
RTN XMC ODU	V100/V200/V300/V500

Intended Audience

This document is intended for:

- Onsite engineers

Change History

This section describes the changes in the *RTN XMC ODU Hardware Description*.

- Compared with issue 09 (2019-06-30), issue 10 (2019-08-30) incorporates the changes described in the following table.

Updated Position	Change History
10.5 Antenna Diameters	Added the new diameters for UHP modular antennas.
1.8.3 XMC-3 ODU	Update the power consumption.

- Compared with issue 08 (2019-03-15), issue 09 (2019-06-30) incorporates the changes described in the following table.

Updated Position	Change History
10.5 Antenna Diameters	Added the new diameters for UHP modular antennas.
1.8.6 XMC-5D ODU	Modified the specifications.

- Compared with issue 07 (2019-01-31), issue 08 (2019-03-15) incorporates the changes described in the following table.

Updated Position	Change History
1.9 Environment performance	Added the environment performance for XMC ODUs.
1.8.6 XMC-5D ODU	Modified the specifications.

- Compared with issue 06 (2018-10-31), issue 07 (2019-01-31) incorporates the changes described in the following table.

Updated Position	Change History
1.8.4 XMC-3W ODU	Added the channel spacings that comply with the FCC standard when working at the 15 GHz frequency band for XMC-3W ODU.

- Compared with issue 05 (2018-08-30), issue 06 (2018-10-31) incorporates the changes described in the following table.

Updated Position	Change History
1.8.5 XMC-3H ODU	Added the 15 GHz frequency band.
1.8.6 XMC-5D ODU	Added the XMC-5D ODU.
3 Flat Coupler (XMC-5D ODU)	Added the flat coupler that adapts to the XMC-5D ODU to combine two channels in the same polarization direction of a single ODU.
4 Dual Coupler (XMC-5D ODU)	Added the double coupler that adapts to the XMC-5D ODU to combine the channels between two ODUs. The double coupler must be used with a flat OMT or a flat coupler.
6 Flat OMT (XMC-5D ODU)	Added the flat OMT that adapts to the XMC-5D ODU to combine channels in the two polarization directions of a single ODU. The flat OMT is applicable only to UHP 2.0 modular antennas and UHP S2D antennas.
9.1 ODU Separate Mounting Bracket	Added the split mounting bracket for the XMC-5D ODU.

Updated Position	Change History
9.2 Flange adapter (XMC-5D ODU)	Added the flexible waveguide adapter board for the XMC-5D ODU in split mounting scenarios.
10.1.5 UHP Modular Antenna	Added the UHP 2.0 modular antenna. The antenna feed can be split and applies to scenarios such as frequency change.

- Compared with issue 04 (2018-08-10), issue 05 (2018-08-30) incorporates the changes described in the following table.

Updated Position	Change History
1.8.5 XMC-3H ODU	Added the 18 GHz frequency band.

- Compared with issue 03 (2018-05-02), issue 04 (2018-08-10) incorporates the changes described in the following table.

Updated Position	Change History
Technical Specifications of the XMC-3H ODU	Changed the rated maximum transmit power.
IF Cable	Added the specifications of 1/2 inch common cables.

- Issue 03 (2018-05-02)

  This is issue 03.

  Compared with issue 02 (2018-01-15), issue 03 does not exclude any topics.

  Compared with issue 02 (2018-01-15), issue 02 includes the following new and modified information:

  - Added the technical specifications of the XMC-3H ODU. For details, see section 1.8.5 XMC-3H ODU.
  - Added the performance attributes, appearance, and ports of the XMC-3H ODU. For details, see sections 1.1, 1.2, and 1.6.
- Issue 02 (2018-01-15)

  This is issue 02.

  Compared with 01 (2017-09-15), issue 02 does not include any new topics or exclude any topics.

  Compared with 01 (2017-09-15), issue 02 incorporates the following modified information:

  - Optimized the transceiver counter table of the ODU in IS3 IF mode. For details, see section 1.8.1 XMC-2 ODU.
- Issue 01 (2017-09-15)

  This is the first commercial release.

  Compared with draft G (2017-06-15), issue 01 does not exclude any topics.

  Compared with draft G (2017-06-15), issue 01 includes the following new and modified information:

- Modified the interface description and electrical specifications of the dual-polarized coupler. For details, see sections 4.3 and 4.4.
- Added the four-port coupler. For details, see chapter 5.
- Modified the description of the ODU split mounting bracket. For details, see section 6.1.
- Modified the specifications of flexible waveguides. For details, see section 6.2.
- Added the UHP SDB antenna. For details, see section 7.1.
- Modified the diameters supported by different types of antennas. For details, see section 7.5.
- Modified the technical specifications of antenna adapters. For details, see chapter 8.

- Draft G (2017-06-15)

  This is draft G.

  Compared with draft F (2016-12-30), draft G does not exclude any topics.

  Compared with draft F (2016-12-30), draft G includes the following new and modified information:

  - Added information about the 13 GHz and 18 GHz frequency sub-bands for the XMC-3W ODU.
  - Added information about 32 GHz (112 MHz) 1024QAM and 2048QAM for the XMC-3 ODU.
  - Modified information about RED certification. For details, see section 1.7.

- Draft F (2016-12-30)

  This is draft F

  Compared with draft E (2016-04-30), draft F does not exclude any topics or incorporate any changes.

  Compared with draft E (2016-04-30), draft F includes the following new information:

  - Added information about the 15 GHz and 23 GHz frequency sub-bands for the XMC-3W ODU.

- Draft E (2016-04-30)

  This is draft E.

  Compared with draft D (2016-03-31), draft E does not exclude any topics or incorporate any changes.

  Compared with draft D (2016-03-31), draft E includes the following new information:

  - Added information about the 7 GHz and 8 GHz frequency sub-bands for the XMC-3W ODU.

- Draft D (2016-03-31)

  This is draft D.

  Compared with draft C (2015-12-31), draft D does not exclude any topics or incorporate any changes.

  Compared with draft C (2015-12-31), draft D includes the following new information:

  - Added information about the 11 GHz frequency sub-band.

- Draft C (2015-12-31)

  This is draft C.

  Compared with draft B (2015-07-30), draft C does not exclude any topics or incorporates any changes.

Compared with draft B (2015-07-30), draft C includes the following new information:

- Added the 3.5 MHz information.
- Added information about the electronic label.
- Added information about frequency sub-band combination.
- Added the 7 GHz and 8 GHz frequency sub-bands.

- Draft B (2015-07-30)

  This is draft B.

  Compared with draft A (2015-02-28), draft B does not exclude any topics or incorporate any changes.

  Compared with draft A (2015-02-28), draft B includes the following new information:

  - Added information about 4096QAM.
  - Added information about the 13 GHz, 15 GHz, 18 GHz, 23 GHz, and 38 GHz frequency bands.

- Draft A (2015-02-28)

  This is draft A.

Contents

1 Outdoor Unit (ODU)

The ODU is an outdoor unit of the digital microwave system. It is used to convert and amplify signals. The ODUs that are described in this document are the RTN XMC ODUs.

The technical specifications of the ODU consist of major reference standards, air temperature, relative humidity, earthquake, mechanical stress, and dustproof and waterproof.

1.1 Device Type

This describes the types of the ODU. The XMC-2/XMC-2H/XMC-3/XMC-3W/XMC-3H ODU is a type of single channel ODU in high power. The XMC-5D ODU is a type of dual channels ODU in high power.

Table 1-1, **Table 1-2** , and **Table 1-3** show the performance and attributes of the ODU.

Table 1-1 Performance attributes of the XMC-2,XMC-2H ODU

Item	XMC-2 ODU	XMC-2H ODU
ODU type	ODU in high power	ODU in high power
Frequency band	6 GHz, 7 GHz, 8 GHz, 10 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz and 42 GHz	L6 GHz, U6 GHz, 7 GHz, 8 GHz and 11 GHz
Microwave modulation format	QPSK, QPSKSTRONG, 16 QAM, 16 QAMSTRONG, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAMLIGHT, 1024 QAM, 1024 QAMLIGHT	QPSK, QPSKSTRONG, 16 QAM, 16 QAMSTRONG, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAMLIGHT, 1024 QAM, 1024 QAMLIGHT and 2048QAM
Channel spacing	3.5 MHz,7 MHz, 14 MHz, 28 MHz, 40 MHz and 56 MHz **NOTE** ● The channel spacings supported by the ODUs comply with ETSI standards. Channel spacings 14 MHz, 28 MHz and 56 MHz apply to most frequency bands; but channel spacings 13.75 MHz 27.5 MHz and 55 MHz apply to the 18 GHz frequency band. ● The 6 GHz, 28 GHz , and 32 GHz frequency bands do not support the 3.5 MHz channel spacing. ● Only the QPSK and 16 QAM modulation modes can be used for the channel spacing of 3.5 MHz.	7 MHz, 14 MHz, 28 MHz, 40 MHz and 56 MHz

Table 1-2 Performance attributes of the XMC-3, XMC-3W, and XMC-3H ODU

Item	XMC-3 ODU	XMC-3W ODU	XMC-3H ODU
ODU type	ODU in high power	ODU in high power	ODU in high power
Frequency band	7 GHz, 8 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, and 38 GHz	7 GHz, 8 GHz, 13 GHz, 15 GHz, 18 GHz, and 23 GHz	15GHz, 18 GHz, 23 GHz, 28 GHz, and 38 GHz
Microwave modulation format	QPSK, QPSKSTRONG, 16QAM, 16QAMSTRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAMLIGHT, 1024QAM, 1024QAMLIGHT, 2048QAM, and 4096QAM	QPSK, QPSKSTRONG, 16QAM, 16QAMSTRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAMLIGHT, 1024QAM, 1024QAMLIGHT, 2048QAM, and 4096QAM	QPSK, QPSKSTRONG, 16QAM, 16QAMSTRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAMLIGHT, 1024QAM, 1024QAMLIGHT, 2048QAM, 4096QAM, and 8192QAM

Item	XMC-3 ODU	XMC-3W ODU	XMC-3H ODU
Channel spacing	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, 56 MHz, and 112 MHz **NOTE** ● The channel spacings supported by XMC-3 ODU comply with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz and 55 MHz, which corresponds to 14 MHz, 28 MHz and 56 MHz in most application scenarios. ● The 3.5 MHz bandwidth supports the modulation mode of QPSK and 16QAM. ● The 112 MHz bandwidth can be implemented only when the IS6 mode of the intermediate frequency (IF) board is used in the 32 GHz working frequencies; the 112 MHz bandwidth supports the modulation format of QPSK, QPSKSTRONG, 16QAM, 16QAMSTRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM and 2048QAM.	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, and 56 MHz (ETSI, 7 GHz, 8 GHz, 13 GHz, 15 GHz, 18 GHz, and 23 GHz) 10 MHz, 20 MHz, 30 MHz, 40 MHz, 50MHz (FCC, 15 GHz) **NOTE** ● The channel spacings supported by XMC-3W ODU comply with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz and 55 MHz, which corresponds to 14 MHz, 28 MHz and 56 MHz in most application scenarios. ● The 3.5 MHz bandwidth supports the modulation mode of QPSK and 16QAM. ● The XMC-3W ODU supports channel spacings that comply with the FCC standard when working at the 15 GHz frequency band. In addition, only the ISM6/CSHR board provides this support working in IS3 mode.	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, 56 MHz, and 112 MHz **NOTE** ● The channel spacings supported by XMC-3H ODU comply with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz and 55 MHz, which corresponds to 14 MHz, 28 MHz and 56 MHz in most application scenarios. ● The 3.5 MHz bandwidth supports the modulation mode of QPSK and 16QAM. ● The 112 MHz bandwidth is supported only in the IS6 and IS8 modes.

Table 1-3 Performance attributes of the XMC-5D ODU

Item	Value
ODU type	Dual channels ODU in high power
Frequency band	13 GHz, 15 GHz, 18 GHz
Microwave modulation format	QPSK, QPSKSTRONG, 16QAM, 16QAMSTRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAMLIGHT, 1024QAM, 1024QAMLIGHT, 2048QAM, and 4096QAM

Item	Value
Channel spacing	7 MHz, 14 MHz, 28 MHz, 40 MHz, 56 MHz, and 112 MHz **NOTE** ● The channel spacings supported by XMC-5D ODU comply with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz and 55 MHz, which corresponds to 14 MHz, 28 MHz and 56 MHz in most application scenarios. ● The 112 MHz bandwidth can be implemented only when the IS6/IS8 mode of the intermediate frequency (IF) board is used in the 18 GHz working frequencies.

1.2 Appearance

The ODU is an outdoor integrated device that adopts the unified design.

Figure 1-1 shows the appearance of the XMC-2/XMC-2H ODU.

Figure 1-1 Appearance of the XMC-2 and XMC-2H ODU

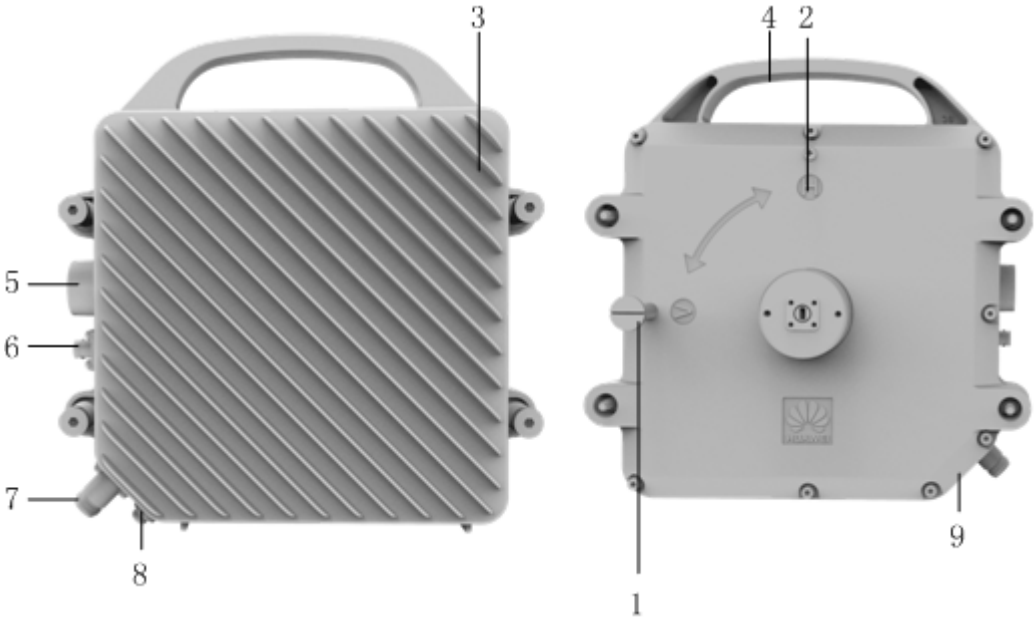


Figure 1-2 shows the appearance of the XMC-3 ODU or XMC-3W ODU.

Figure 1-2 Appearance of the XMC-3/XMC-3W ODU

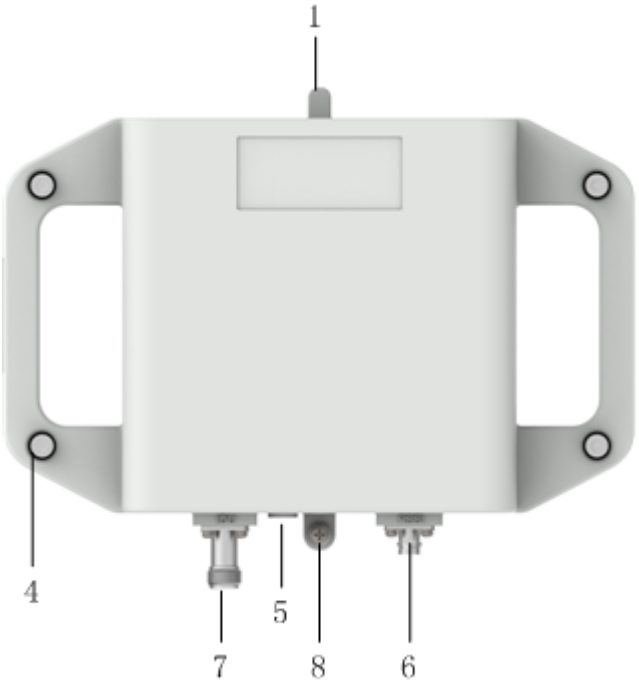


Figure 1-3 shows the appearance of the XMC-3H ODU.

Figure 1-3 Appearance of the XMC-3H ODU

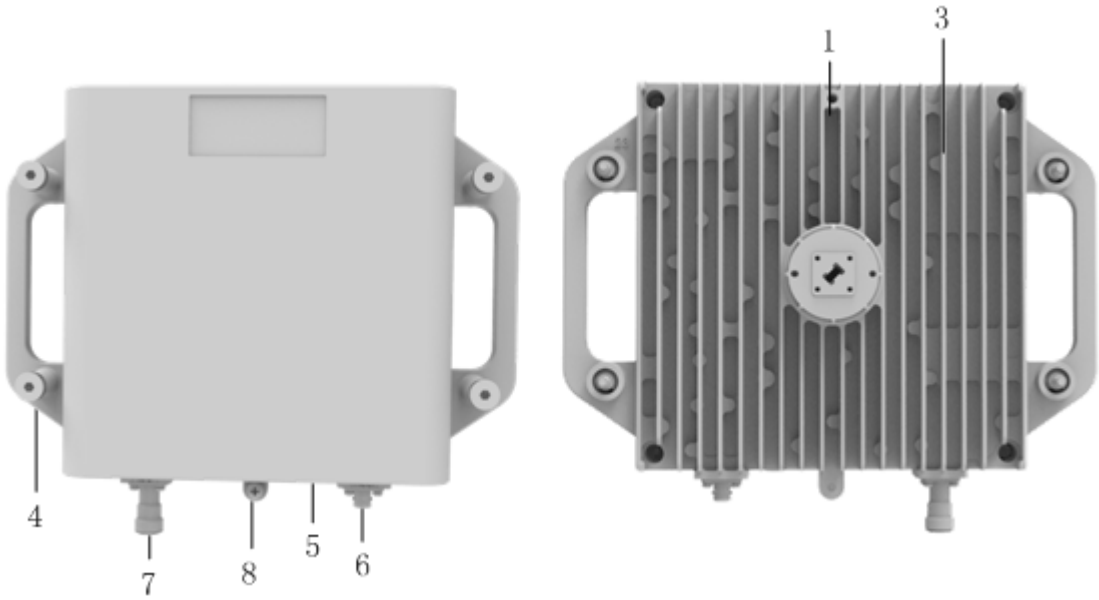


Figure 1-4 shows the appearance of the XMC-5D ODU.

Figure 1-4 Appearance of the XMC-5D ODU

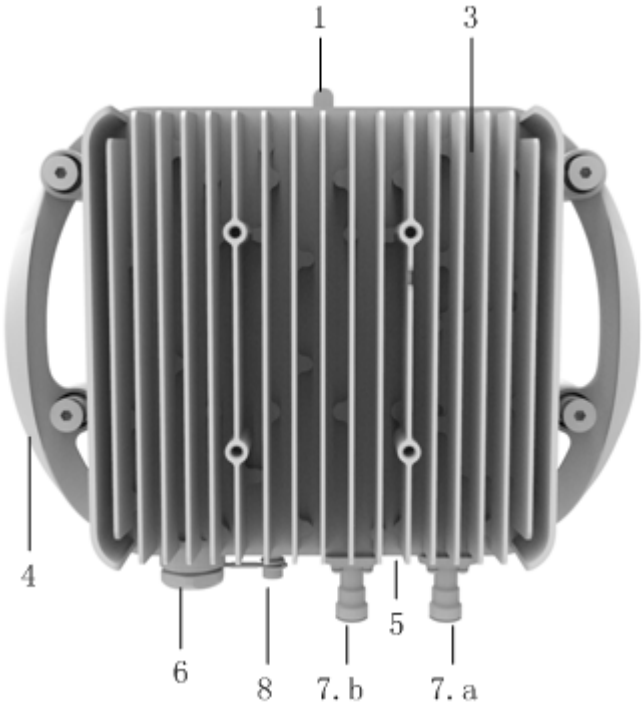


Table 1-4 describes the appearance of the ODU.

Table 1-4 Appearance description of the ODU

Serial No.	Item	Description
1	Guide pin	The guide pin is used together with the guide trough to facilitate the installation of the ODU.
2	Polarization direction identifier	H: Horizontal polarization V: Vertical polarization
3	Cooling fins	The 45°slant angle of the cooling fins ensures the ventilation of the ODU in horizontal-polarized and vertical-polarized conditions to facilitate heat dissipation. The XMC-3H and XMC-5D have the vertical cooling fins.
4	Handle	The handle is used to facilitate the holding and installation of the ODU.
5	Pressure vent \Pressure hole	Ensures that the pressure inside the ODU and that outside the ODU are the same, thus preventing explosion. In addition, the pressure vent valve can prevent moisture. The XMC-2/XMC-2H ODU has the pressure vent, and the XMC-3/XMC-3W/XMC-3H/XMC-5D ODU has the pressure hole.

Serial No.	Item	Description
6	RSSI interface	See **Interfaces on the ODU**.
7	Single-channel ODU: IF interface XMC-5D ODU: 7.a: IF interface IF1 7.b: IF interface IF2	
8	Grounding screw	
9	Cut corner	In horizontal and vertical conditions, cables are inclined from the cut corner to enhance waterproof reliability.

NOTE

Numbers in **Table 1-4** correspond to those in **Figure 1-1** to **Figure 1-4**.

1.3 Functions

The ODU, a microwave RF unit, has the function of frequency conversion and power amplification. The ODU determines microwave frequencies of the transmitted and received signals and is not affected by transmission service types such as the TDM Serivce and Ethernet service.

The ODU supports the following features:

- Various channel spacing.
- Various modulation formats.
- Adaptive modulation (AM) function.
- Adjustment of TX/RX frequencies through software.
- Adjustment of TX power through software.
- Temperature detection.
- TX power detection.
- RX power detection.
- Received Signal Strength Indicator (RSSI) interface:

  The ODU has an RSSI interface, which indicates the RX power in voltage.
- Mute transmission.
- Automatic Transmit Power Control (ATPC).
- Remote Transmission Power Control (RTPC).

- Automatic Gain Control (AGC) function of received signals:

  The ODU automatically adjusts the channel gain according to the level of received signals.
- XMC-5D ODU supports carrier aggregation (CA).

1.4 Working Principles

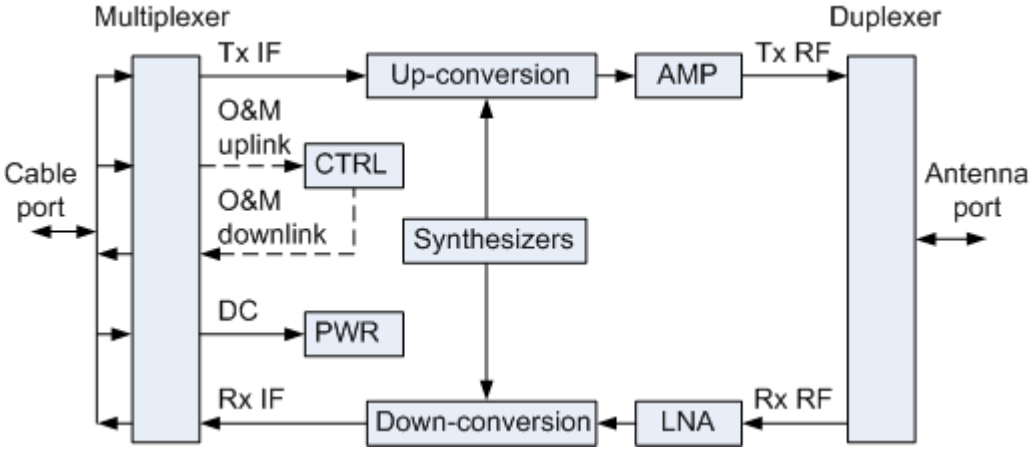
This describes the working principles of the ODU. The working principles of different types of ODUs are similar.

The dual-channel XMC-5D ODU has two IF interfaces and two antenna ports to convert and amplify two channels of signals. The following uses the working principles of a single-channel ODU as an example.

Working Principles

Figure 1-5 shows the ODU principles.

Figure 1-5 Working principles of the ODU



The ODU is located between the IDU and the antenna system, implementing the functions of frequency conversion and amplification of signals. The working principles of the ODU are as follows:

- Processing of the signals to be transmitted

  The multiplexer unit divides the input signals transmitted through the IF cable into the IF TX signals, O&M uplink signals, and -48 V DC power signals.

  The IF TX signals are processed as follows:

  a. The IF TX signals are up-converted, filtered, and amplified to RF TX signals. Then, the RF TX signals are sent to the AMP unit.

  b. The AMP unit amplifies the power of the RF TX signals. The power of the RF TX signals can be controlled by the IDU software.

  c. The amplified RF TX signals are sent to the antenna through the duplexer isolation unit.

The O&M uplink signals are the 5.5 MHz signals modulated in Amplitude Shift Keying (ASK) mode. The signals are sent to the CTRL unit and demodulated.

The -48 V DC power signals are sent to the PWR unit. The PWR generates secondary power supplies for each module of the ODU.

- Processing of the received signals
  a. The duplexer isolation unit separates the RF input signals from other signals received by the antenna.
  b. The RF signals are amplified through the Low Noise Amplifier (LNA) unit.
  c. The amplified RF signals are down-converted, filtered, and amplified to IF RX signals and transmitted to the multiplexer unit.
  d. The multiplexer unit combines the IF RX signals and O&M downlink signals and then transmits the combined signals to the IDU through IF cable.

  The CTRL unit performs the ASK modulation on the O&M downlink signals to generate 10 MHz signals. The modulated signals are transmitted to the multiplexer unit. The CTRL unit provides the RSSI interface and monitors the RX level through the RSSI circuit.

1.5 Installation Mode

The ODU can be installed on the antenna in two modes: direct mounting mode and separate mounting mode.

NOTICE

The ODU does not support hot swapping.

Direct Mounting Mode

When the small-diameter and single-polarized antenna is used, the direct mounting mode is usually adopted. In this case, if one ODU uses one antenna, the ODU should be installed at the back of the antenna. If two ODUs share one antenna, one RF signal combiner-divider (hereinafter referred to as hybrid coupler) should be added between the antenna and the ODU.

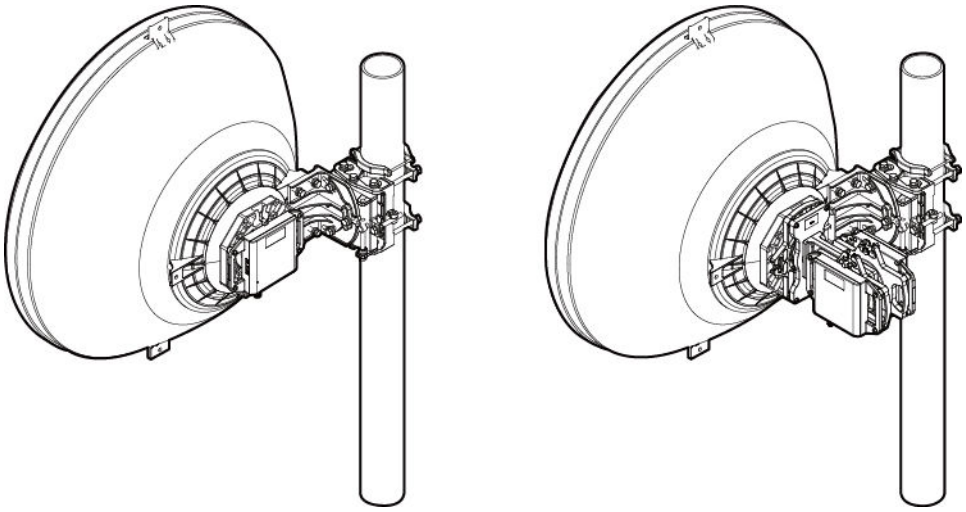
NOTE

Use a hybrid coupler adaptive to the XMC ODU if two ODUs are configured with only one antenna installed in direct mounting mode.

If a single XMC-5D ODU is installed on an antenna in direct mounting mode, a hybrid coupler or an OMT must be configured.

Figure 1-6 shows the direct mounting mode. In this document, XMC-3/XMC-3W/XMC-3H ODU is used as an example.

Figure 1-6 Direct mounting mode



Separate Mounting Mode

When the dual-polarized antenna or the large-diameter and single-polarized antenna is used, the separate mounting mode is adopted. In this case, two ODUs can share one feed boom by adding a hybrid coupler.

In separate mounting mode, the ODU separated mounting bracket is used to fix the ODU or hybrid coupler on the pole. The ODU or hybrid coupler and the antenna are connected through a flexible wave guide.

NOTE

If a single XMC-5D ODU is installed in split mounting mode, a flexible waveguide adapter and an XMC-5D split mounting bracket must be configured.

Figure 1-7 shows the split mounting of a single-polarized antenna. In this document, XMC-3/XMC-3W/XMC-3H ODU is used as an example.

Figure 1-7 Separate mounting mode using a single-polarized antenna

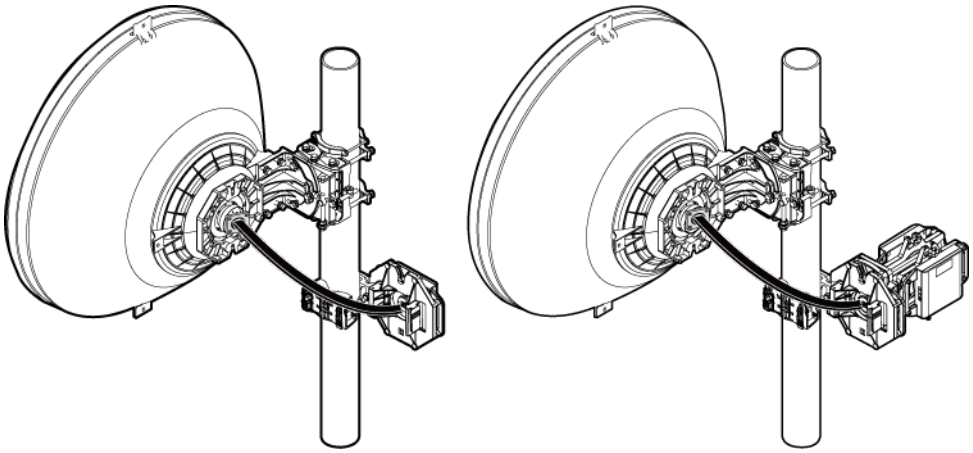
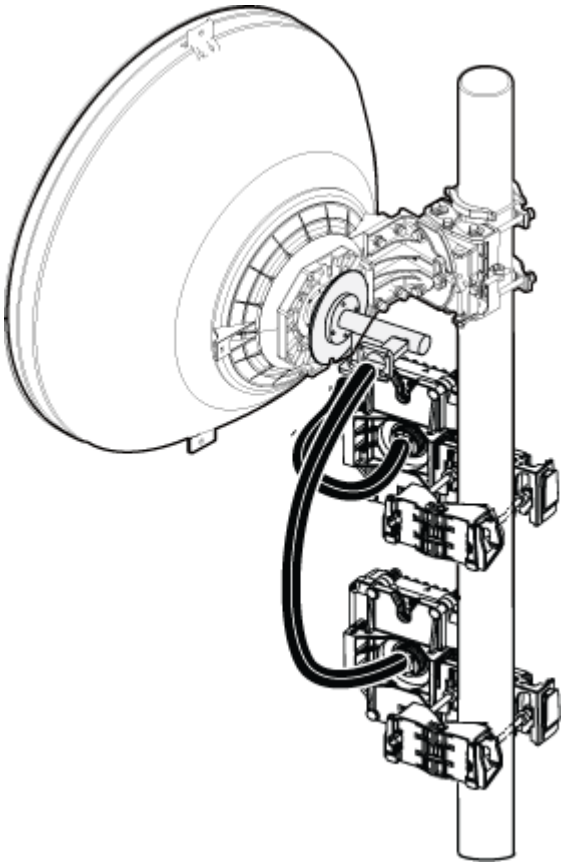


Figure 1-8 shows the split mounting of a dual-polarized antenna.

Figure 1-8 Split mounting mode using a dual-polarized antenna



1.6 Interfaces

ODU interfaces include the antenna interface, IF interface, RSSI interface, and grounding screw.

Figure 1-9 shows interfaces on the XMC-2/XMC-2H ODU.

Figure 1-9 Interfaces on the XMC-2/XMC-2H ODU

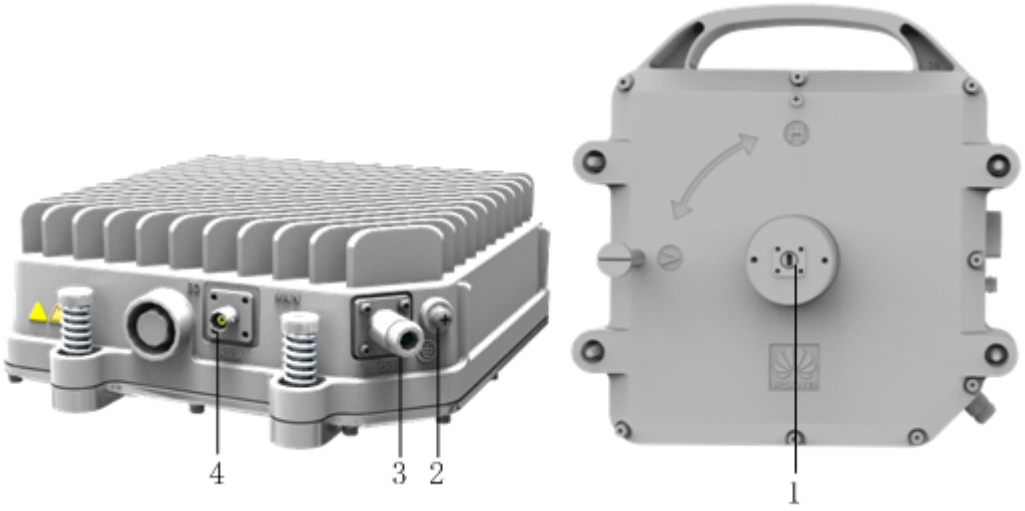


Figure 1-10 shows interfaces on the XMC-3 ODU and XMC-3W ODU.

Figure 1-10 Interfaces on the XMC-3/XMC-3W ODU

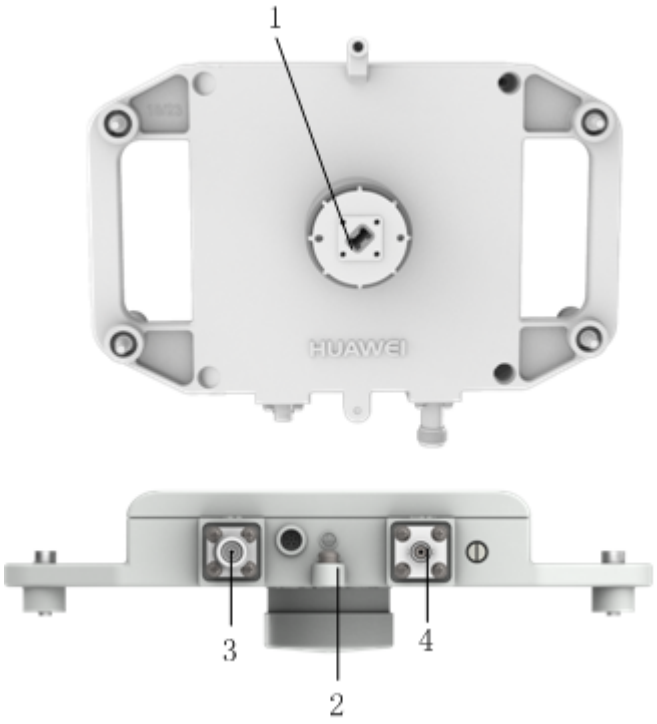


Figure 1-11 shows interfaces on the XMC-3H ODU.

Figure 1-11 Interfaces on the XMC-3H ODU

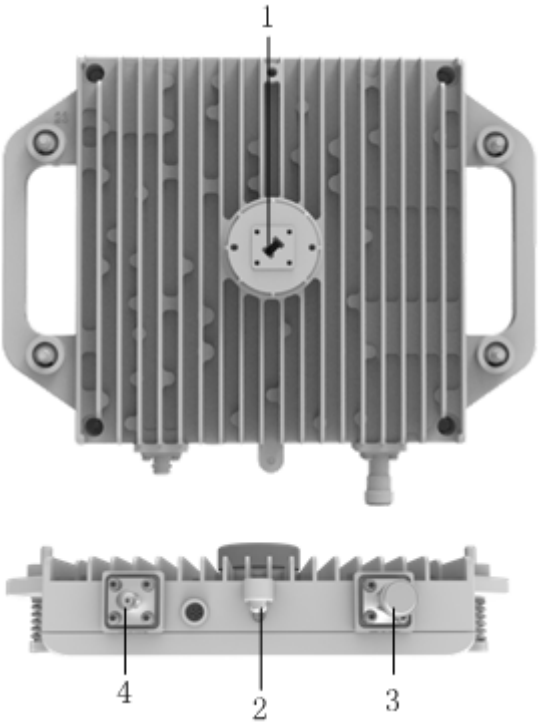


Figure 1-12 shows interfaces on the XMC-5D ODU.

Figure 1-12 Interfaces on the XMC-5D ODU

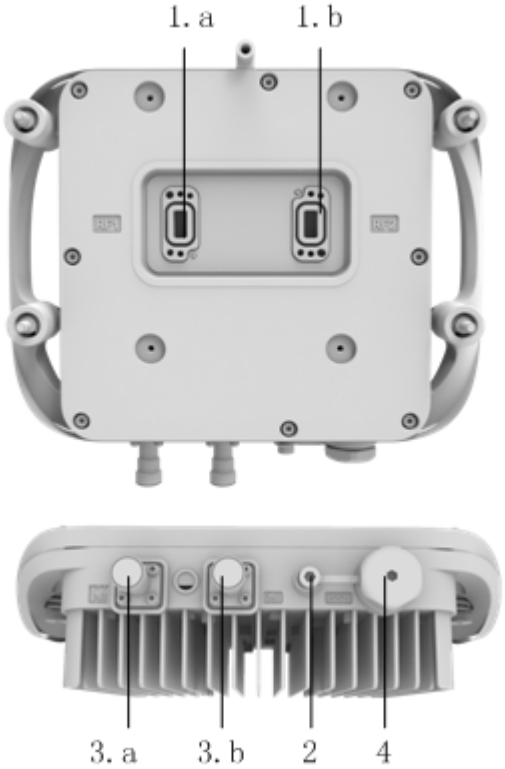


Table 1-5 describes interfaces on the ODU.

Table 1-5 Interfaces on the ODU

No.	Interface Name	Interface Type	Description
1	Single-channel ODU: Antenna interface	153IEC-R70, can be interconnected with the PDR70 (6 GHz frequency band) 153IEC-R84, can be interconnected with the PBR84 (7/8 GHz frequency band) 153IEC-R100, can be interconnected with the PBR100 (10G/11 GHz frequency band) 153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band) 153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18/23/26 GHz frequency band) 153IEC-R320, can be interconnected with the PBR320 (28/32/38 GHz frequency band) UG 383/U-R400, can be interconnected with the UG 383/U-R400 (42 GHz frequency band)	The antenna interface is a waveguide interface that is connected to an antenna, a hybrid coupler, an antenna adapter, or a flexible waveguide. **NOTE** The antenna interface on the XMC-3/XMC-3W ODU can adapt to the polarization direction of the antenna. Therefore, no manual adjustment is required.
	XMC-5D ODU: 1.a: Antenna interface RF1 1.b: Antenna interface RF2	153IEC-R140, can be interconnected with the PBR140 (13 GHz/15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18 GHz frequency band)	The antenna interface is connected to the antenna or flexible waveguide through a hybrid coupler, OMT, or flexible waveguide adapter board. **NOTE** The antenna interface of the XMC-5D ODU can adapt to the polarization direction of the adaptive antenna. You do not need to manually adjust the polarization direction of the XMC-5D ODU.
2	Grounding screw	M5 screw	The grounding screw is connected to the **PGND cable**.

No.	Interface Name	Interface Type	Description
3	Single-channel ODU: IF interface XMC-5D ODU: 3.a: IF interface IF1 3.b: IF interface IF2	N type (female)	The IF interface is connected to the IDU through an **IF cable**. For XMC-5D ODU: ● The IF interface IF1 provides the power supply function. The IF interface IF2 cannot provide the power supply function. ● The IF interface IF1 corresponds to the RF interface RF1, and the IF interface IF2 corresponds to the RF interface RF2. ● When only one channel is used, the IF1 and RF1 interfaces are required.
4	RSSI interface	XMC-2/XMC-2H/XMC-3H ODU: BNC type (female) XMC-3/XMC-3W ODU: TNC type (female) XMC-5D ODU: RJ45 connector	RSSI level indication interface. The level of the received signal of the ODU can be calculated based on the voltage of the interface that is measured through a multimeter.

Figure 1-13 RJ45 connector front view

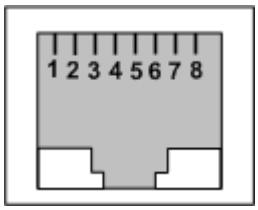


Table 1-6 Pin assignments for the RJ45 connector of the RSSI port

Pin No.	Signal
1	RSSI test level signal for the main carrier of the RF1 channel
2	Ground
3	RSSI test level signal for the standby carrier of the RF1 channel
4	Ground
5	Ground
6	RSSI test level signal for the standby carrier of the RF2 channel

Pin No.	Signal
7	Ground
8	RSSI test level signal for the main carrier of the RF2 channel

1.7 Labels

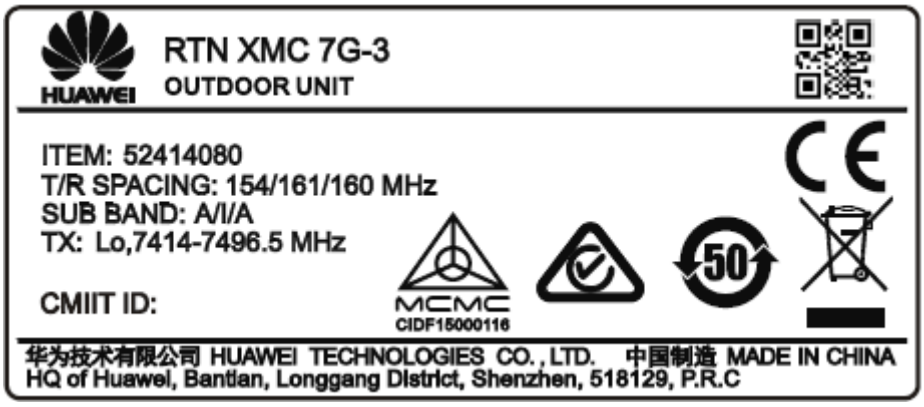
The following labels are attached to the ODU: nameplate label, bar code, radiation label, and overtemperature label. These labels are used to identify the device information, radiation alarm, and overtemperature alarm of the ODU.

The ODU labels and the meanings of the labels are describes as follows:

- Nameplate Label

  Figure 1-14 shows the nameplate label of the ODU.

  Figure 1-14 Nameplate label of the ODU



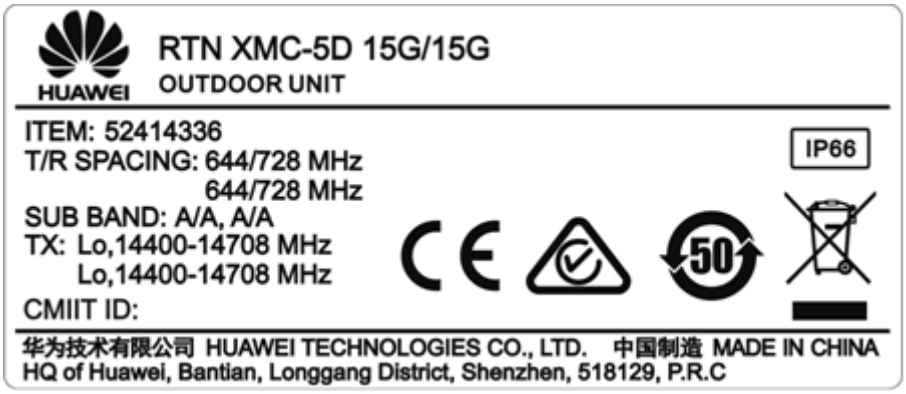


  Table 1-7 and **Table 1-8** describe the meanings of the parameters on the nameplate label.

Table 1-7 Meanings of the parameters on the nameplate label (single-channel ODU)

Label Information	Content of the Label	Parameter	Meaning
ODU name	RTN XMC 7G-3 ① ② OUTDOOR UNIT ③	①: Frequency band	Working frequency of the ODU (GHz)
		②: ODU type	2: high capacity ODU 2H: high power ODU 3: very high capacity ODU 3W: wide-band ODU 3H: ODU in high power
		③: Component name	Indicates that the component is an ODU
ODU code (ITEM)	52414080	-	Used to identify the type of the ODU
ODU T/R spacing (T/R SPACING)	154/161/160 MHz	-	Spacing between RX and TX frequencies (MHz)
ODU subband (SUB BAND)	A/I/A	-	Frequency subbands numbered with letters
TX status information about the ODU (TX)	Lo,7414-7496.5 MHz ① ②	①: TX high/low station	Hi: TX high station Lo: TX low station
		②: Range of the TX frequency	Range of the ODU TX frequency (MHz)
CMIIT ID	-	-	ID of Radio Transmission Equipment Type Approval Certificate (domestic)

Table 1-8 Meanings of the parameters on the nameplate label (XMC-5D ODU)

Label Information	Content of the Label	Parameter	Meaning
ODU name	RTN XMC-5D ② 15G/15G ① OUTDOOR UNIT ③	①: Frequency band	Working frequencies of the two channels on the ODU (GHz): Working frequency of channel 1/ Working frequency of channel 2
		②: ODU type	RTN XMC-5D: Dual-channel ODU in high power
		③: Component name	Indicates that the component is an ODU
ODU code (ITEM)	52414336	-	Used to identify the type of the ODU
ODU T/R spacing (T/R SPACING)	644/728 MHz 644/728 MHz	-	Spacing between RX and TX frequencies of the two channels (MHz) : T/R spacing of channel 1 T/R spacing of channel 2
ODU subband (SUB BAND)	A/A, A/A	-	Frequency subbands of the two channels numbered with letters: Frequency subbands of channel 1, Frequency subbands of channel 2

Label Information	Content of the Label	Parameter	Meaning
TX status information about the ODU (TX)	Lo,14400-14708 MHz Lo,14400-14708 MHz ① ②	①: TX high/low station	Hi: TX high station Lo: TX low station **NOTE** TX status information of channel 1 TX status information of channel 2
		②: Range of the TX frequency	Range of the ODU TX frequency (MHz)
CMIIT ID	-	-	ID of Radio Transmission Equipment Type Approval Certificate (domestic)

- Bar Code and Warning Label

  Table 1-9 shows the bar code and warning labels of the ODU and describes the meanings of the labels.

  Table 1-9 Bar code and warning label

Name	Appearance	Meaning
Bar code		Bar code of the ODU serial number, which is used to uniquely identify each ODU
Warning label		The warning labels from left to right indicate the following: ● Electrostatic warning ● Radiation warning ● Overtemperature warning
		High-voltage warning

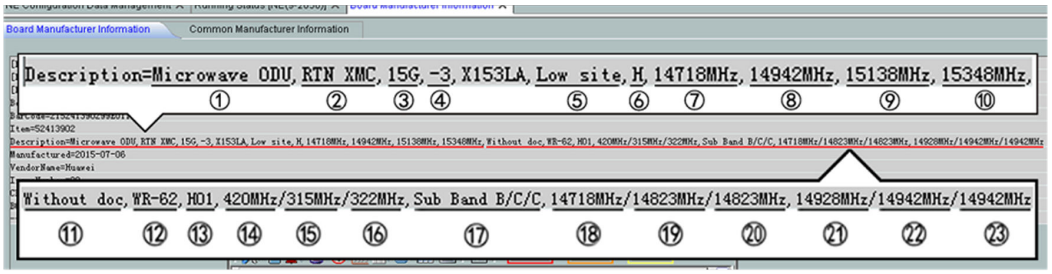
- Electronic label (E-Label)

  Figure 1-15 shows the E-Label of an ODU.

  NOTE

  This document takes the E-Label of XMC-3 ODU 15 GHz frequency band as an example.

Figure 1-15 E-Label of an ODU



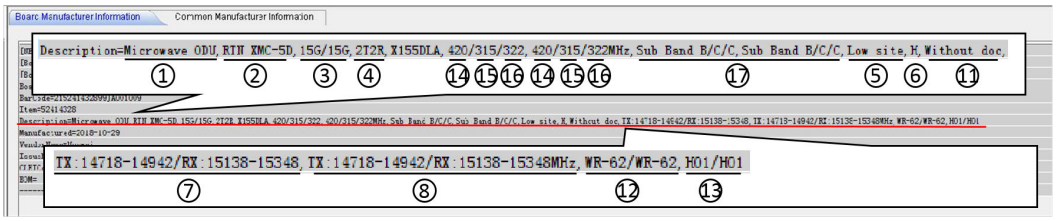


Table 1-10 Items on the E-label

Number	Description	Number	Description
1	Name	12, 13	Additional description
2	Product category	14	TR spacing 1 For XMC-5D ODU, the same two numbers indicates the TR spacing 1s of the two channels.
3	Frequency band	15	TR spacing 2 For XMC-5D ODU, the same two numbers indicates the TR spacing 2s of the two channels.
4	Performance	16	TR spacing 3 For XMC-5D ODU, the same two numbers indicates the TR spacing 3s of the two channels.
5	High/low site	17	Sub Band
6	Transmit power level	18	TX start frequency 1 (Single-Channel ODU)
7	Single-Channel ODU: TX start frequency XMC-5D ODU: The Tx/Rx frequency information for channel 1	19	TX start frequency 2 (Single-Channel ODU)

Number	Description	Number	Description
8	Single-Channel ODU: TX end frequency XMC-5D ODU: The Tx/Rx frequency information for channel 2	20	TX start frequency 3 (Single-Channel ODU)
9	RX start frequency (Single-Channel ODU)	21	TX end frequency 1 (Single-Channel ODU)
10	RX end frequency (Single-Channel ODU)	22	TX end frequency 2 (Single-Channel ODU)
11	Document language	23	TX end frequency 3 (Single-Channel ODU)

Table 1-11 Key information on E-Label (Single-Channel ODU)

T/R Spacing (MHz)	Sub Band	TX Frequency Lower Limit(MHz)	TX Frequency Upper Limit(MHz)
420	B	14,718.00	14,928.00
315	C	14,823.00	14,942.00
322	C	14,823.00	14,942.00

1.8 Technical Specifications

The technical specifications of the ODU consist of working formats, frequency bands, transceiver specifications, IF specifications, integrated system specifications, and frequency information.

NOTE

En dashes (–) in tables below indicate the corresponding modulation modes are not supported.

1.8.1 XMC-2 ODU

This describes the technical specifications of the XMC-2 ODU.

Working Formats

Table 1-12 lists the modulation format and the channel spacing of the ODU.

Table 1-12 Working formats of the ODU (XMC-2 ODU)

Item	Specification
Modulation format	QPSK/QPSK Strong/16QAM/16QAM Strong/32QAM/64QAM/128QAM/256QAM/512QAM/512QAM Light/1024QAM/1024QAM Light
Channel spacing	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, and 56 MHz
NOTE ● The enhancement modes QPSK Strong, 16 QAM Strong, 512 QAM, 512 QAM Light, 1024 QAM, and 1024 QAM Light can be implemented only when the IS3 mode of the intermediate frequency (IF) board is used in the 6 GHz, 7 GHz, 8 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz, and 42 GHz working frequencies. ● The enhancement modes QPSK Strong, 16 QAM Strong, 512 QAM, 512 QAM Light, 1024 QAM, and 1024 QAM Light for the 10 GHz frequency band must work in IS3 mode of the intermediate frequency (IF) board provided in RTN900 V100R005C01 or later. ● The duct interval supported by XMC-2 ODU complies with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75/27.5/55 MHz, which corresponds to 14/28/56 MHz in most application scenarios. ● The 10 GHz(TR91 MHz) frequency band does not support the 40 MHz and the 56 MHz channel spacing. ● The 6 GHz, 28 GHz , and 32 GHz frequency bands do not support the 3.5 MHz channel spacing. ● Only the QPSK and 16 QAM modulation modes can be used for the channel spacing of 3.5 MHz.	

Frequency Bands

Table 1-13 lists the working frequency bands of the ODU.

Table 1-13 Working frequency bands of the ODU (XMC-2 ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
6 GHz	From 5.925 to 7.125	252.04, 160/170, and 340/350
7 GHz	From 7.093 to 7.897	154, 161, 168, 196, and 245
8 GHz	From 7.731 to 8.497	119/126, 151.614, 208, 266,303, 310 and 311.32 **NOTE** 310 is a sub-frequency band of the 8 GHz-2E frequency band .
10 GHz	From 10.130 to 10.650	350
	From 10.500 to 10.678	91
11 GHz	From 10.675 to 11.745	500/490, 530/520
13 GHz	From 12.751 to 13.248	266
15 GHz	From 14.400 to 15.358	315/322, 420, 490, 644, and 728

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
18 GHz	From 17.685 to 19.710	1010/1008, 1092.5, 1560
23 GHz	From 21.200 to 23.618	1008, 1050, 1200, and 1232
26 GHz	From 24.250 to 26.453	1008
28 GHz	From 27.520 to 29.481	1008
32 GHz	From 31.815 to 33.383	812
38 GHz	From 37.044 to 40.105	1260
42 GHz	From 40.522 to 43.464	1500

Transceiver Specifications

Table 1-14 and Table 1-15 list the transceiver specifications of the ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

When the receive power of the ODU is between -90 dBm and -70 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

When the receive power of the ODU is between -30 dBm and -20 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

Table 1-14 Transceiver specifications of the ODU (XMC-2 ODU,IS2/IF2)

Item	Specification					
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
Rated maximum TX power (dBm) **NOTE** ● When the working frequency is 7 GHz or 8 GHz and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format reduces by 3 dB. ● When the working frequency is 7 GHz-2E or 8 GHz-2E and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format do not decrease.						
6 GHz	30 dBm	28 dBm	26.5 dBm	25 dBm	25 dBm	23 dBm
7 GHz	26.5 dBm	25.5 dBm	25.5 dBm	25 dBm	25 dBm	23 dBm
8 GHz	26.5 dBm	25.5 dBm	25.5 dBm	25 dBm	25 dBm	23 dBm
7 GHz-2E	30 dBm	26 dBm	26 dBm	25 dBm	25 dBm	23 dBm

Item	Specification					
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
8 GHz-2E	30 dBm	26 dBm	26 dBm	25 dBm	25 dBm	23 dBm
10 GHz (TR350 MHz)	26.5 dBm	23.5 dBm	23.5 dBm	21.5 dBm	21.5 dBm	19.5 dBm
10 GHz (TR91 MHz)	24.5 dBm	22.5 dBm	22.5 dBm	20.5 dBm	20.5 dBm	18.5 dBm
11 GHz	26 dBm	24 dBm	24 dBm	22 dBm	22 dBm	20 dBm
13 GHz	25 dBm	22 dBm	22 dBm	20.5 dBm	20.5 dBm	17.5 dBm
15 GHz	25 dBm	22 dBm	22 dBm	20.5 dBm	20.5 dBm	18.5 dBm
18 GHz	24 dBm	21 dBm	21 dBm	19.5 dBm	19.5 dBm	16.5 dBm
23 GHz	24 dBm	21 dBm	21 dBm	19.5 dBm	19.5 dBm	17.5 dBm
26 GHz	22 dBm	20 dBm	20 dBm	18 dBm	18 dBm	16 dBm
28 GHz	25 dBm	22 dBm	21.5 dBm	19 dBm	19 dBm	17 dBm
32 GHz	23 dBm	21 dBm	19.5 dBm	17 dBm	17 dBm	15 dBm
38 GHz	20 dBm	17 dBm	17 dBm	16 dBm	16 dBm	14 dBm
42 GHz	16 dBm	12 dBm	12 dBm	11 dBm	11 dBm	9 dBm
Rated minimum TX power(dBm)						
6 GHz	0 dBm					
7 GHz	6.5 dBm					
8 GHz	6.5 dBm					
10 GHz(TR350 MHz)	0 dBm					
10 GHz(TR91 MHz)	0 dBm					
11 GHz	0 dBm					
13 GHz	5 dBm					
15 GHz	5 dBm					

Item	Specification					
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
18 GHz	4 dBm					
23 GHz	4 dBm					
26 GHz	0 dBm					
28 GHz	-3 dBm					
32 GHz	-3 dBm					
38 GHz	0 dBm					
42 GHz	-5 dBm					
Maximum RF RX power	● 6/7/8/10/11/13/15/18/23/26/28/32/38 GHz QPSK/16 QAM/32 QAM/64 QAM/128 QAM/256 QAM: -20 dBm ● 42 GHz QPSK/16 QAM/32 QAM: -20 dBm 64 QAM/128 QAM: -23 dBm 256 QAM: -25 dBm					
Frequency stability	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.					

Table 1-15 Transceiver specifications of the ODU (XMC-2 ODU, IS3)

Item	Specification								
	QPSK/QPSK Strong	16QAM/16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/512QAM Light	1024QAM	1024QAM Light
Rated maximum TX power (dBm) **NOTE** ● When the working frequency is 7 GHz or 8 GHz and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format reduces by 3 dB. ● When the working frequency is 7 GHz-2E or 8 GHz-2E and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format do not reduces. ● 7 GHz-2E and 8 GHz-2E are the new version, support QPSK Strong, 16QAM Strong, 512QAM, 512QAM Light, 1024QAM, 1024QAM Light and 2048QAM Modulation format.									
6 GHz	30 dBm	28 dBm	26.5 dBm	25 dBm	25 dBm	23 dBm	21 dBm	19 dBm	-

Item	Specification								
	QPSK / QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024 QAM	1024 QAM Light
7 GHz	26.5 dBm	25.5 dBm	25.5 dBm	25 dBm	25 dBm	23 dBm	-	-	-
8 GHz	26.5 dBm	25.5 dBm	25.5 dBm	25 dBm	25 dBm	23 dBm	-	-	-
7 GHz-2E	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm
8 GHz-2E	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm
10 GHz (TR 350 MHz)	26.5 dBm	24.5 dBm	24.5 dBm	23.5 dBm	23.5 dBm	21.5 dBm	21.5 dBm	19.5 dBm	19.5 dBm
10 GHz (TR 91 MHz)	24.5 dBm	23.5 dBm	23.5 dBm	22.5 dBm	22.5 dBm	20.5 dBm	20.5 dBm	18.5 dBm	18.5 dBm
11 GHz	26 dBm	25 dBm	25 dBm	24 dBm	24 dBm	22 dBm	22 dBm	20 dBm	20 dBm
13 GHz	25 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	20 dBm	18 dBm	18 dBm
15 GHz	25 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	21 dBm	19 dBm	19 dBm
18 GHz	24 dBm	23 dBm	23 dBm	22 dBm	22 dBm	20 dBm	19 dBm	17 dBm	17 dBm
23 GHz	24 dBm	23 dBm	23 dBm	22 dBm	22 dBm	19.5 dBm	19.5 dBm	18 dBm	18 dBm
26 GHz	22 dBm	21 dBm	21 dBm	20 dBm	20 dBm	17 dBm	17 dBm	15 dBm	15 dBm

Item	Specification								
	QPSK / QPSK Strong	**16QAM/ 16QAM Strong**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM/ 512QAM Light**	**1024 QAM**	**1024 QAM Light**
28 GHz	25 dBm	22 dBm	21.5 dBm	19 dBm	19 dBm	17 dBm	15 dBm	13 dBm	-
32 GHz	23 dBm	21 dBm	19.5 dBm	17 dBm	17 dBm	15 dBm	13 dBm	11 dBm	-
38 GHz	20 dBm	18 dBm	18 dBm	17 dBm	17 dBm	16 dBm	15 dBm	13 dBm	13 dBm
42 GHz	16 dBm	14 dBm	14 dBm	13 dBm	13 dBm	11 dBm	10 dBm	8 dBm	8 dBm
Rated minimum TX power (dBm)									
6 GHz	0 dBm								
7 GHz	6.5 dBm						-		
8 GHz	6.5 dBm						-		
7 GHz-2E	6.5 dBm								
8 GHz-2E	6.5 dBm								
10 GHz (TR 350 MHz)	0 dBm								
10 GHz (TR 91 MHz)	0 dBm								
11 GHz	0 dBm								

Item	Specification								
	QPSK / QPSK Strong	**16QAM/ 16QAM Strong**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM/ 512QAM Light**	**1024 QAM**	**1024 QAM Light**
13 GHz	5 dBm								
15 GHz	5 dBm								
18 GHz	4 dBm								
23 GHz	4 dBm								
26 GHz	0 dBm								
28 GHz	-5 dBm								
32 GHz	-5 dBm								
38 GHz	0 dBm								
42 GHz	-5 dBm								
Maximum RF RX power	● 6 GHz, 7 GHz, 8 GHz, 10 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz and 38 GHz QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM, 64 QAM, 128 QAM and 256 QAM: -20 dBm ● 42 GHz QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM: -20 dBm 64 QAM, 128 QAM: -23 dBm 256 QAM: -25 dBm						-25 dBm		
Frequency stability	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.								

IF Specifications

Table 1-16 lists the IF specifications of the ODU.

Table 1-16 IF specifications of the ODU (XMC-2 ODU)

Item		Specification
IF signal	Center frequency of the input IF	350 MHz
	Center frequency of the RX IF	140 MHz
	Return loss of the IF interface	< -15 dB
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5 MHz
	Downlink signal	10 MHz

Integrated System Specifications

Table 1-17 lists the integrated system specifications of the ODU.

Table 1-17 Integrated system specifications of the ODU (XMC-2 ODU)

Item	Specification
Integrated system dimensions	6 GHz, 10 GHz, 11 GHz, 26 GHz, 28 GHz, 32 GHz and 42 GHz:228 mm x 75 mm x 228 mm (width x depth x height) 7 GHz, 8 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz and 38 GHz:222 mm x 75 mm x 222 mm (width x depth x height)
Weight	≤ 4.5 kg
Power supply	-48 V (from -32 V to -72 V) DC
Power consumption	≤ 35 W (6 GHz frequency band) ≤ 33 W (7 GHz and 8 GHz frequency band) ≤ 36 W (10 GHz and 11 GHz frequency band) ≤ 27 W (13 GHz frequency band) ≤ 26 W (15 GHz frequency band) ≤ 30 W (18 GHz, 28 GHz, 32 GHz and 42 GHz frequency band) ≤ 28 W (23 GHz, 26 GHz and 38 GHz frequency band)

Frequency Information

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

Table 1-18 lists the information about the 6 GHz frequency band.

Table 1-18 Information about the 6 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
252.04	A	5,925.00	6,025.00	6,175.00	6,275.00
252.04	B	6,000.00	6,100.00	6,250.00	6,350.00
252.04	C	6,075.00	6,175.00	6,325.00	6,425.00
160/170	A	6,540.00	6,600.00	6,700.00	6,760.00
160/170	B	6,580.00	6,640.00	6,740.00	6,800.00
160/170	C	6,620.00	6,680.00	6,780.00	6,840.00
160/170	D	6,660.00	6,710.00	6,820.00	6,870.00
340/350	A	6,425.00	6,540.00	6,765.00	6,880.00
340/350	B	6,520.00	6,630.00	6,860.00	6,970.00
340/350	C	6,600.00	6,710.00	6,940.00	7,050.00
340/350	D	6,670.00	6,785.00	7,010.00	7,125.00

Table 1-19 lists the information about the 7 GHz frequency band.

Table 1-19 Information about the 7 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	A	7,428.00	7,484.00	7,582.00	7,638.00
154	B	7,470.00	7,526.00	7,624.00	7,680.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	C	7,512.00	7,568.00	7,666.00	7,722.00
154	D	7,128.00	7,184.00	7,282.00	7,338.00
154	E	7,170.00	7,226.00	7,324.00	7,380.00
154	F	7,212.00	7,268.00	7,366.00	7,422.00
154 **NOTE** This is special requirements;	G	7,456.00	7,512.00	7,610.00	7,666.00
154 **NOTE** This is special requirements;	H	7,484.00	7,540.00	7,638.00	7,694.00
160	A	7,433.50	7,496.50	7,593.50	7,656.50
160	B	7,478.50	7,541.50	7,638.50	7,701.50
160	C	7,526.00	7,589.00	7,686.00	7,749.00
161	A	7,114.00	7,177.00	7,275.00	7,338.00
161	B	7,149.00	7,212.00	7,310.00	7,373.00
161	C	7,180.50	7,247.00	7,341.50	7,408.00
161	D	7,219.00	7,282.00	7,380.00	7,443.00
161	E	7,239.00	7,302.00	7,400.00	7,463.00
161	F	7,274.00	7,337.00	7,435.00	7,498.00
161	G	7,309.00	7,372.00	7,470.00	7,533.00
161	H	7,344.00	7,407.00	7,505.00	7,568.00
161	I	7,414.00	7,477.00	7,575.00	7,638.00
161	J	7,449.00	7,512.00	7,610.00	7,673.00
161	K	7,484.00	7,547.00	7,645.00	7,708.00
161	L	7,519.00	7,582.00	7,680.00	7,743.00
161	M	7,539.00	7,602.00	7,700.00	7,763.00
161	N	7,574.00	7,637.00	7,735.00	7,798.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
161	O	7,609.00	7,672.00	7,770.00	7,833.00
161	P	7,644.00	7,707.00	7,805.00	7,868.00
161 **NOTE** This is special requirements;	Q	7,128.00	7,184.00	7,289.00	7,345.00
161 **NOTE** This is special requirements;	R	7,212.00	7,268.00	7,373.00	7,429.00
161 **NOTE** This is special requirements;	S	7,428.00	7,484.00	7,589.00	7,645.00
161 **NOTE** This is special requirements;	T	7,512.00	7,568.00	7,673.00	7,729.00
161 **NOTE** This is special requirements;	U	7,208.50	7,264.50	7,369.50	7,425.50
161 **NOTE** This is special requirements;	V	7,508.50	7,564.50	7,669.50	7,725.50
168	A	7,443.00	7,499.00	7,611.00	7,667.00
168	B	7,485.00	7,541.00	7,653.00	7,709.00
168	C	7,527.00	7,583.00	7,695.00	7,751.00
168	D	7,110.50	7,170.00	7,278.50	7,338.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
168	E	7,163.00	7,205.00	7,331.00	7,373.00
168	F	7,198.00	7,236.50	7,366.00	7,404.50
168	G	7,226.00	7,261.00	7,394.00	7,429.00
196	A	7,093.00	7,177.00	7,289.00	7,373.00
196	B	7,149.00	7,233.00	7,345.00	7,429.00
196	C	7,205.00	7,261.00	7,401.00	7,457.00
245	A	7,400.00	7,484.00	7,645.00	7,729.00
245	B	7,484.00	7,568.00	7,729.00	7,813.00
245	C	7,568.00	7,652.00	7,813.00	7,897.00

Table 1-20 lists the information about the 8 GHz frequency band.

Table 1-20 Information about the 8 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
119/126	A	8,279.00	8,321.00	8,398.00	8,440.00
119/126	B	8,307.00	8,349.00	8,426.00	8,468.00
119/126	C	8,335.00	8,377.00	8,454.00	8,496.00
119/126	D	8,321.00	8,349.00	8,440.00	8,468.00
119/126	E	8,335.00	8,363.00	8,454.00	8,482.00
119/126	F	8,349.00	8,377.00	8,468.00	8,496.00
151.614	A	8,203.00	8,271.00	8,355.00	8,423.00
151.614	B	8,240.00	8,308.00	8,392.00	8,460.00
151.614	C	8,277.00	8,345.00	8,429.00	8,497.00
208	A	8,043.00	8,113.00	8,251.00	8,321.00
208	B	8,099.00	8,169.00	8,307.00	8,377.00
208	C	8,155.00	8,225.00	8,363.00	8,433.00
208	D	8,211.00	8,281.00	8,419.00	8,489.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
266	A	7,905.00	8,024.00	8,171.00	8,290.00
266	B	8,017.00	8,136.00	8,283.00	8,402.00
310	A	7,905.00	8,017.00	8,215.00	8,327.00
310	B	8,017.00	8,129.00	8,327.00	8,439.00
310	C	8,129.00	8,185.00	8,439.00	8,495.00
311.32	A	7,731.00	7,867.00	8,042.00	8,178.00
311.32	B	7,835.00	7,971.00	8,146.00	8,282.00

Table 1-21 lists the information about the 10 GHz frequency band.

Table 1-21 Information about the 10 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
350	A	10,130.00	10,300.00	10,480.00	10,650.00
91	A	10,500.00	10,531.00	10,591.00	10,622.00
91	B	10,528.00	10,559.00	10,619.00	10,650.00
91	C	10,556.00	10,587.00	10,647.00	10,678.00

Table 1-22 lists the information about the 11 GHz frequency band.

Table 1-22 Information about the 11 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
500/490	A	10,700.00	10,980.00	11,200.00	11,480.00
500/490	B	10,920.00	11,200.00	11,420.00	11,700.00
530/520	A	10,675.00	10,975.00	11,205.00	11,505.00
530/520	B	10,915.00	11,215.00	11,445.00	11,745.00

Table 1-23 lists the information about the 13 GHz frequency band.

Table 1-23 Information about the 13 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
266	A	12,751.00	12,870.00	13,017.00	13,136.00
266	B	12,863.00	12,982.00	13,129.00	13,248.00
266	C	12,751.00	12,891.00	13,017.00	13,157.00

Table 1-24 lists the information about the 15 GHz frequency band.

Table 1-24 Information about the 15 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315/322	A	14,627.00	14,746.00	14,942.00	15,061.00
315/322	B	14,725.00	14,844.00	15,040.00	15,159.00
315/322	C	14,823.00	14,942.00	15,138.00	15,257.00
420	A	14,501.00	14,725.00	14,921.00	15,145.00
420	B	14,718.00	14,928.00	15,138.00	15,348.00
490	A	14,403.00	14,634.00	14,893.00	15,124.00
490	B	14,627.00	14,858.00	15,117.00	15,348.00
644	A	14,400.00	14,708.00	15,044.00	15,352.00
728	A	14,500.00	14,625.00	15,228.00	15,353.00

Table 1-25 lists the information about the 18 GHz frequency band.

Table 1-25 Information about the 18 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	A	17,685.00	18,230.00	18,695.00	19,240.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	B	18,180.00	18,700.00	19,190.00	19,710.00
1560	C	17,700.00	18,140.00	19,260.00	19,700.00
1092.5	A	17,712.50	18,060.00	18,805.00	19,152.50
1092.5	B	17,987.50	18,595.00	19,080.00	19,687.50

Table 1-26 lists the information about the 23 GHz frequency band.

Table 1-26 Information about the 23 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	21,990.50	22,330.00	22,998.50	23,338.00
1008	B	22,274.00	22,610.00	23,282.00	23,618.00
1008	C	22,260.00	22,610.00	23,268.00	23,618.00
1050 **NOTE** This is special requirements;	A	21,950.25	22,498.00	23,000.25	23,548.00
1200	A	21,200.00	21,600.00	22,400.00	22,800.00
1200	B	21,600.00	22,000.00	22,800.00	23,200.00
1200	C	21,950.00	22,400.00	23,150.00	23,600.00
1232	A	21,200.00	21,786.00	22,432.00	23,018.00
1232	B	21,779.00	22,386.00	23,011.00	23,618.00

Table 1-30 lists the information about the 26 GHz frequency band.

Table 1-27 Information about the 26 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	24,549.00	24,885.00	25,557.00	25,893.00
1008	B	24,829.00	25,165.00	25,837.00	26,173.00
1008	C	25,109.00	25,445.00	26,117.00	26,453.00

Table 1-28 lists the information about the 28 GHz frequency band.

Table 1-28 Information about the 28 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	27,520.00	28,025.00	28,528.00	29,033.00
1008	B	27,968.00	28,473.00	28,976.00	29,481.00

Table 1-29 lists the information about the 32 GHz frequency band.

Table 1-29 Information about the 32 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
812	A	31,815.00	32,207.00	32,627.00	33,019.00
812	B	32,179.00	32,571.00	32,991.00	33,383.00

Table 1-27 lists the information about the 38 GHz frequency band.

Table 1-30 Information about the 38 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1260	A	37,044.00	37,632.00	38,304.00	38,892.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1260	B	37,604.00	38,192.00	38,864.00	39,452.00

Table 1-31 lists the information about the 42 GHz frequency band.

Table 1-31 Information about the 42 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1500	A	40,522.00	41,306.00	42,022.00	42,806.00
1500	B	41,194.00	41,964.00	42,694.00	43,464.00

1.8.2 XMC-2H ODU

This describes the technical specifications of the XMC-2H ODU.

Working Formats

Table 1-32 lists the modulation format and the channel spacing of the ODU.

Table 1-32 Working formats of the ODU (XMC-2H ODU)

Item	Specification
Modulation format	QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAM Light, 1024 QAM, 1024 QAM Light, and 2048 QAM
Channel spacing	7 MHz, 14 MHz, 28 MHz, 40 MHz, and 56 MHz
NOTE ALL modulation formats can be implemented only when the IS3 mode of the intermediate frequency (IF) board is used in the L6 GHz, U6 GHz, 7 GHz, 8 GHz, and 11 GHz working frequencies.	

Frequency Bands

Table 1-33 list the working frequency bands of the ODU.

Table 1-33 Working frequency bands of the ODU (XMC-2H ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
L6 GHz	From 5.925 to 6.425	252.04
U6 GHz	From 6.425 to 7.125	340/350
7 GHz	From 7.093 to 7.897	154, 161, 168, 196, 245, and 160
8 GHz	From 7.731 to 8.497	119/126, 151.614, 208, 266, 310 and 311.32
11 GHz	From 10.675 to 11.745	500/490, 530/520

Transceiver Specifications

Table 1-34 list the transceiver specifications of the ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

When the receive power of the ODU is between -90 dBm and -70 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

When the receive power of the ODU is between -30 dBm and -20 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

Table 1-34 Transceiver specifications of the ODU (XMC-2H ODU)

Item	Specification								
	QPSK / QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
Rated maximum TX power (dBm)									
L6 GHz	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	28.5 dBm	28.5 dBm	27.5 dBm	25.5 dBm
U6 GHz	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	28.5 dBm	28.5 dBm	27.5 dBm	25.5 dBm
7 GHz	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	28.5 dBm	28.5 dBm	27.5 dBm	25.5 dBm
8 GHz	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	30.5 dBm	28.5 dBm	28.5 dBm	27.5 dBm	25.5 dBm

Item	Specification								
	QPSK / QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
11 GHz	28.5 dBm	28.5 dBm	28.5 dBm	28.5 dBm	28.5 dBm	26.5 dBm	26.5 dBm	25.5 dBm	23.5 dBm
Rated minimum TX power (dBm)									
L6/ U6/7/ 8/11 GHz	5 dBm								
Maximum RF RX power	-20 dBm						-25 dBm		-28 dBm
Frequency stability (from -33° C to +55° C)	≤ ±5 ppm **NOTE** When the T/R spacing is 252.04 MHz, 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.								

IF Specifications

Table 1-35 lists the IF specifications of the ODU.

Table 1-35 IF specifications of the ODU (XMC-2H ODU)

Item		Specification
IF signal	Center frequency of the input IF	350 MHz
	Center frequency of the RX IF	140 MHz

Item		Specification
	Return loss of the IF interface	< -15 dB
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5 MHz
	Downlink signal	10 MHz

Integrated System Specifications

Table 1-36 list the integrated system specifications of the ODU.

Table 1-36 Integrated system specifications of the ODU (XMC-2H ODU)

Item	Specification
Integrated system dimensions	228 mm x 91 mm x 228 mm (width x depth x height)
Weight	≤ 5 kg (L6 GHz, U6 GHz frequency band) ≤ 4.5 kg (7 GHz, 8 GHz and 11 GHz frequency band)
Power supply	-48 V (from -36 V to -60 V) DC
Power consumption	≤ 42 W

Frequency Information

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

L6 GHz Frequency Band

Table 1-37 lists the information about the L6 GHz frequency band.

Table 1-37 Information about the L6 GHz frequency band (XMC-2H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
252.04	A	5,925.00	6,004.00	6,177.00	6,256.00
252.04	B	5,974.00	6,063.00	6,226.00	6,315.00
252.04	C	6,034.00	6,123.00	6,286.00	6,375.00
252.04	D	6,093.00	6,173.00	6,345.00	6,425.00

U6 GHz Frequency Band

Table 1-38 lists the information about the U6 GHz frequency band.

Table 1-38 Information about the U6 GHz frequency band (XMC-2H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
340/350	A	6,425.00	6,509.00	6,765.00	6,849.00
340/350	B	6,471.00	6,569.00	6,811.00	6,909.00
340/350	C	6,536.00	6,619.00	6,876.00	6,959.00
340/350	D	6,591.00	6,689.00	6,931.00	7,029.00
340/350	E	6,631.00	6,729.00	6,971.00	7,069.00
340/350	F	6,701.00	6,785.00	7,041.00	7,125.00

7 GHz Frequency Band

Table 1-39 lists the information about the 7 GHz frequency band.

Table 1-39 Information about the 7 GHz frequency band (XMC-2H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	A	7,428.00	7,484.00	7,582.00	7,638.00
154	B	7,470.00	7,526.00	7,624.00	7,680.00
154	C	7,512.00	7,568.00	7,666.00	7,722.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	D	7,128.00	7,184.00	7,282.00	7,338.00
154	E	7,170.00	7,226.00	7,324.00	7,380.00
154	F	7,212.00	7,268.00	7,366.00	7,422.00
161	A	7,114.00	7,177.00	7,275.00	7,338.00
161	B	7,149.00	7,212.00	7,310.00	7,373.00
161	C	7,180.50	7,247.00	7,341.50	7,408.00
161	D	7,219.00	7,282.00	7,380.00	7,443.00
161	E	7,239.00	7,302.00	7,400.00	7,463.00
161	F	7,274.00	7,337.00	7,435.00	7,498.00
161	G	7,309.00	7,372.00	7,470.00	7,533.00
161	H	7,344.00	7,407.00	7,505.00	7,568.00
161	I	7,414.00	7,477.00	7,575.00	7,638.00
161	J	7,449.00	7,512.00	7,610.00	7,673.00
161	K	7,484.00	7,547.00	7,645.00	7,708.00
161	L	7,519.00	7,582.00	7,680.00	7,743.00
161	M	7,539.00	7,602.00	7,700.00	7,763.00
161	N	7,574.00	7,637.00	7,735.00	7,798.00
161	O	7,609.00	7,672.00	7,770.00	7,833.00
161	P	7,644.00	7,707.00	7,805.00	7,868.00
168	A	7,443.00	7,499.00	7,611.00	7,667.00
168	B	7,485.00	7,541.00	7,653.00	7,709.00
168	C	7,527.00	7,583.00	7,695.00	7,751.00
168	D	7,110.50	7,170.00	7,278.50	7,338.00
168	E	7,163.00	7,205.00	7,331.00	7,373.00
168	F	7,198.00	7,236.50	7,366.00	7,404.50
168	G	7,226.00	7,261.00	7,394.00	7,429.00
196	A	7,093.00	7,177.00	7,289.00	7,373.00
196	B	7,149.00	7,233.00	7,345.00	7,429.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
196	C	7,205.00	7,261.00	7,401.00	7,457.00
245	A	7,400.00	7,484.00	7,645.00	7,729.00
245	B	7,484.00	7,568.00	7,729.00	7,813.00
245	C	7,568.00	7,652.00	7,813.00	7,897.00
160	A	7,433.50	7,496.50	7,593.50	7,656.50
160	B	7,478.50	7,541.50	7,638.50	7,701.50
160	C	7,526.00	7,589.00	7,686.00	7,749.00

8 GHz Frequency Band

Table 1-40 lists the information about the 8 GHz frequency band.

Table 1-40 Information about the 8 GHz frequency band (XMC-2H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
119/126	A	8,279.00	8,321.00	8,398.00	8,440.00
119/126	B	8,307.00	8,349.00	8,426.00	8,468.00
119/126	C	8,335.00	8,377.00	8,454.00	8,496.00
151.614	A	8,203.00	8,271.00	8,355.00	8,423.00
151.614	B	8,240.00	8,308.00	8,392.00	8,460.00
151.614	C	8,277.00	8,345.00	8,429.00	8,497.00
208	A	8,043.00	8,113.00	8,251.00	8,321.00
208	B	8,099.00	8,169.00	8,307.00	8,377.00
208	C	8,155.00	8,225.00	8,363.00	8,433.00
208	D	8,211.00	8,281.00	8,419.00	8,489.00
266	A	7,905.00	8,024.00	8,171.00	8,290.00
266	B	8,017.00	8,136.00	8,283.00	8,402.00
310	A	7,905.00	8,017.00	8,215.00	8,327.00
310	B	8,017.00	8,129.00	8,327.00	8,439.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
310	C	8,129.00	8,185.00	8,439.00	8,495.00
311.32	A	7,731.00	7,867.00	8,042.00	8,178.00
311.32	B	7,835.00	7,971.00	8,146.00	8,282.00

11 GHz Frequency Band

Table 1-41 lists the information about the 11 GHz frequency band.

Table 1-41 Information about the 11 GHz frequency band (XMC-2H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
500/490	A	10,700.00	10,980.00	11,200.00	11,480.00
500/490	B	10,920.00	11,200.00	11,420.00	11,700.00
530/520	A	10,675.00	10,975.00	11,205.00	11,505.00
530/520	B	10,915.00	11,215.00	11,445.00	11,745.00

1.8.3 XMC-3 ODU

This describes the technical specifications of the XMC-3 ODU.

Working Formats

Table 1-42 lists the modulation format and the channel spacing of the ODU.

Table 1-42 Working formats of the ODU (XMC-3 ODU)

Item	Specification
Modulation format	QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAM Light, 1024 QAM, 1024 QAM Light, 2048 QAM and 4096 QAM
Channel spacing	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, 56 MHz, and 112 MHz

Item	Specification
NOTE ● The channel spacings supported by XMC-3 ODU complies with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75/27.5/55 MHz, which corresponds to 14/28/56 MHz in most application scenarios. ● The 3.5 MHz bandwidth can be implemented only when the IS3 mode of the intermediate frequency (IF) board is supports the modulation mode of QPSK and 16 QAM. ● The 112 MHz bandwidth can be implemented only when the IS6/IS8 mode of the intermediate frequency (IF) board is used in the 32 GHz working frequencies;The 112 MHz bandwidth supports the modulation format of QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 1024 QAM and 2048 QAM. The 1024 QAM requires the cable length to be less than 12 m or greater than 30 m. The 2048 QAM supports only AM and does not support ATPC. This format requires the cable length to be less than 12 m or greater than 60 m. ● When the IS6 mode of the intermediate frequency (IF) board is used in the 28 GHz, 32 GHz and 38 GHz. Channel spacing is 7 MHz, the modulation mode can be QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAM Light and 1024 QAM. Channel spacing is 14 MHz, 28 MHz, 40 MHz or 56 MHz the modulation mode can be QPSK, QPSK Strong, 16 QAM, 16 QAM Strong, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAM Light, 1024 QAM and 2048 QAM. 2048 QAM supports only the AM. ● The 4096 QAM can be implemented only when the IS6 mode of the intermediate frequency (IF) board is used and under the normal temperature condition in the 7 GHz, 8 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, and 26 GHz working frequencies; 4096 QAM supports only Channel spacing is 28 MHz, 40 MHz and 56 MHz; 4096QAM is supported only when the AM function is supported. ATPC is not supported. ● The cable length requirements for the 4096 QAM in the 26 GHz working frequencies are as follows: If the Channel spacing is 28 MHz, the cable length must be less than 30 m or greater than 40 m; If the Channel spacing is 40 MHz or 56 MHz, the cable length must be less than 30 m or greater than 80 m. ● The cable length requirements for the 4096 QAM in the 7 GHz, 8 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz and 23 GHz working frequencies are as follows: If the Channel spacing is 40 MHz or 56 MHz, the cable length must be less than 30 m or greater than 80 m.	

Frequency Bands

Table 1-43 list the working frequency bands of the ODU.

Table 1-43 Working frequency bands of the ODU (XMC-3 ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
7 GHz	From 7.093 to 7.897	154, 160, 161, 168, 196, 245
8 GHz	From 7.731 to 8.497	119/126, 151.614, 208, 266, 310, 311.32
11 GHz	From 10.675 to 11.745	490, 500, 520, 530
13 GHz	From 12.751 to 13.248	266
15 GHz	From 14.400 to 15.358	315/322, 420, 490, 644, 728
18 GHz	From 17.685 to 19.710	1010/1008, 1092.5, 1560
23 GHz	From 21.200 to 23.618	1008, 1050, 1200, 1232

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
26 GHz	From 24.25 to 26.453	1008
28 GHz	From 27.52 to 29.481	1008
32 GHz	From 31.815 to 33.383	812
38 GHz	From 37.044 to 40.105	1260

Transceiver Specifications

The following table lists the transceiver specifications of the XMC-3 ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB; The maximum error between the actual transmit power of the 38GHz 0 dB to -10dB and the preset transmit power on the NMS is ±3 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

When the receive power of the ODU is between -90 dBm and -70 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

When the receive power of the ODU is between -30 dBm and -20 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

Only XMC-3 ODUs manufactured since October 2017 support the current rated maximum TX power.

Transceiver specifications of the XMC-3 ODU (IS3)

Table 1-44 Rated maximum TX power of the XMC-3 ODU

Item	Specification								
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024 QAM / 1024 QAM Light	2048 QAM
7 GHz	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	21 dBm
8 GHz	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	21 dBm
11 GHz	27 dBm	25 dBm	25 dBm	25 dBm	25 dBm	23 dBm	23 dBm	20 dBm	20 dBm
13 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	21 dBm	20 dBm	19 dBm

Item	Specification								
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
15 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm
18 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	19 dBm
23 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	20.5 dBm	20.5 dBm	19 dBm	19 dBm
26 GHz	22 dBm	21 dBm	21 dBm	19 dBm	19 dBm	17 dBm	17 dBm	15 dBm	15 dBm
28 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm
32 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm	16 dBm
38 GHz	20 dBm	18 dBm	18 dBm	17 dBm	17 dBm	16 dBm	16 dBm	14 dBm	13 dBm

Table 1-45 Rated minimum TX power of the XMC-3 ODU

Item	Specification								
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
7 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
8 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
11 GHz	-4 dBm	-4 dBm	-4dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm

Item	Specification								
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
23 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
26 GHz	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm
28 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm
32 GHz	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	3 dBm
38 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	0 dBm

Table 1-46 Maximum RF RX power of the XMC-3 ODU

Item	Specification								
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
7 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
8 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
11 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm

Item	Specification								
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAM Light	1024QAM / 1024QAM Light	2048QAM
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
26 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
28 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
32 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
38 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm

Table 1-47 ATPC maximun range and Frequency stability of the XMC-3 ODU

Item	Specification	
	ATPC maximun range	Frequency stability (from -33°C to +55°C)
7 GHz	30 dB	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.
8 GHz	30 dB	
11 GHz	32 dB	
13 GHz	34 dB	
15 GHz	34 dB	
18 GHz	35 dB	
23 GHz	35 dB	
26 GHz	32 dB	
28 GHz	33 dB	
32 GHz	33 dB	

Item	Specification	
	ATPC maximun range	Frequency stability (from -33°C to +55°C)
38 GHz	30 dB	

Transceiver specifications of the XMC-3 ODU (IS6)

Table 1-48 Rated maximum TX power of the XMC-3 ODU

Item	Specification									
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	21 dBm	20 dBm
8 GHz	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	21 dBm	20 dBm
11 GHz	27 dBm	25 dBm	25 dBm	25 dBm	25 dBm	23 dBm	23 dBm	20 dBm	20 dBm	18 dBm
13 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	21 dBm	20 dBm	19 dBm	19 dBm
15 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm	19 dBm
18 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	19 dBm	19 dBm
23 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	20.5 dBm	20.5 dBm	19 dBm	19 dBm	19 dBm
26 GHz	22 dBm	21 dBm	21 dBm	19 dBm	19 dBm	17 dBm	17 dBm	15 dBm	15 dBm	14 dBm
28 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm	-
32 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm	16 dBm	-
32 GHz(112 MHz)	22 dBm	18 dBm	18 dBm	17 dBm	17 dBm	16 dBm	14 dBm	11 dBm	11 dBm	-

Item	Specification									
	QPSK/QPSK Strong	16QAM/16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
38 GHz	20 dBm	18 dBm	18 dBm	17 dBm	17 dBm	16 dBm	16 dBm	14 dBm	13 dBm	-

Table 1-49 Rated minimum TX power of the XMC-3 ODU

Item	Specification									
	QPSK/QPSK Strong	16QAM/16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
8 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
11 GHz	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
23 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
26 GHz	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm
28 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-
32 GHz	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	3 dBm	-

Item	Specification									
	QPSK/QPSK Strong	16QAM/16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
32 GHz(112 MHz)	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	–2 dBm	5 dBm	-
38 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	0 dBm	-

Table 1-50 Maximum RF RX power of the XMC-3 ODU

Item	Specification									
	QPSK/QPSK Strong	16QAM/16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
8 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
11 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
26 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
28 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-

Item	Specification									
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
32 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-
38 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-

Table 1-51 ATPC maximun range and Frequency stability of the XMC-3 ODU

Item	Specification	
	ATPC maximun range	Frequency stability (from -33 °C to +55 °C)
7 GHz	30 dB	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.
8 GHz	30 dB	
11 GHz	32 dB	
13 GHz	34 dB	
15 GHz	34 dB	
18 GHz	35 dB	
23 GHz	35 dB	
26 GHz	32 dB	
28 GHz	33 dB	
32 GHz	33 dB	
38 GHz	30 dB	

Transceiver specifications of the XMC-3 ODU (IS8)

Table 1-52 Rated maximum TX power of the XMC-3 ODU

Item	Specification									
	QPSK/QPSK Strong	16QAM/16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	21 dBm	20 dBm
8 GHz	30 dBm	28 dBm	28 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm	21 dBm	20 dBm
11 GHz	27 dBm	25 dBm	25 dBm	25 dBm	25 dBm	23 dBm	23 dBm	20 dBm	20 dBm	18 dBm
13 GHz	25 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	20 dBm	18 dBm	18 dBm	17 dBm
15 GHz	25 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	21 dBm	19 dBm	19 dBm	18 dBm
18 GHz	24 dBm	23 dBm	23 dBm	22 dBm	22 dBm	20 dBm	19 dBm	17 dBm	17 dBm	16 dBm
23 GHz	24 dBm	23 dBm	23 dBm	22 dBm	22 dBm	19.5 dBm	19.5 dBm	18 dBm	18 dBm	17 dBm
26 GHz	22 dBm	21 dBm	21 dBm	19 dBm	19 dBm	17 dBm	17 dBm	15 dBm	15 dBm	14 dBm
28 GHz	22 dBm	20 dBm	20 dBm	19 dBm	19 dBm	17 dBm	16 dBm	15 dBm	15 dBm	-
32 GHz	22 dBm	20 dBm	20 dBm	19 dBm	19 dBm	17 dBm	16 dBm	15 dBm	15 dBm	-
38 GHz	20 dBm	18 dBm	18 dBm	17 dBm	17 dBm	16 dBm	15 dBm	13 dBm	13 dBm	-

Table 1-53 Rated minimum TX power of the XMC-3 ODU

Item	Specification									
	QPSK/ QPSK Strong	**16QAM/ 16QAM Strong**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**
7 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
8 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
11 GHz	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
23 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
26 GHz	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm
28 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-
32 GHz	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	-10 dBm	3 dBm	-
32 GHz(112 MHz)	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	− 2 dBm	5 dBm	-
38 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	0 dBm	-

Table 1-54 Maximum RF RX power of the XMC-3 ODU

Item	Specification									
	QPSK/ QPSK Strong	16QAM/ 16QAM Strong	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
8 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
11 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
26 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
28 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-
32 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-
38 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-

Table 1-55 ATPC maximun range and Frequency stability of the XMC-3 ODU

Item	Specification	
	ATPC maximun range	Frequency stability (from -33 °C to +55 °C)
7 GHz	30 dB	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.
8 GHz	30 dB	
11 GHz	32 dB	

Item	Specification	
	ATPC maximun range	Frequency stability (from -33 °C to +55 °C)
13 GHz	33 dB	
15 GHz	33 dB	
18 GHz	34 dB	
23 GHz	34 dB	
26 GHz	32 dB	
28 GHz	32 dB	
32 GHz	32 dB	
38 GHz	30 dB	

IF Specifications

Table 1-56 lists the IF specifications of the ODU.

Table 1-56 IF specifications of the ODU (XMC-3 ODU)

Item		Specification
IF signal	Center frequency of the input IF	350 MHz
	Center frequency of the RX IF	140 MHz
	Return loss of the IF interface	< -15 dB
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5 MHz
	Downlink signal	10 MHz

Integrated System Specifications

Table 1-57 list the integrated system specifications of the ODU.

Table 1-57 Integrated system specifications of the ODU (XMC-3 ODU)

Item	Specification
Integrated system dimensions	7 GHz, 8 GHz, 11 GHz: 195 mm x 43.5 mm x 195 mm (width x depth x height) 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz: 172 mm x 41.5 mm x 172 mm (width x depth x height)
Weight	13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz: ≤ 2.5 kg 7 GHz, 8 GHz, 11 GHz: ≤ 2.8 kg
Power supply	-48 V (from -36 V to -60 V) DC
Power consumption	7 GHz, 8 GHz, 11 GHz: ≤ 30 W 13 GHz, 15 GHz, 26 GHz: ≤ 20.5 W 18 GHz, 23 GHz: ≤ 29 W 28 GHz, 32 GHz: ≤ 25 W 38 GHz: ≤ 22 W

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

7 GHz Frequency Band

Table 1-58 lists the information about the 7 GHz frequency band.

Table 1-58 Information about the 7 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	A	7,427.00	7,485.00	7,581.00	7,639.00
154	B	7,456.00	7,526.00	7,610.00	7,680.00
154	C	7,512.00	7,568.00	7,666.00	7,722.00
154	D	7,128.00	7,184.00	7,282.00	7,338.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	E	7,170.00	7,226.00	7,324.00	7,380.00
154	F	7,212.00	7,268.00	7,366.00	7,422.00
154 **NOTE** This is special requirements;	G	7,484.00	7,541.00	7,638.00	7,695.00
154 **NOTE** This is special requirements;	H	7,539.00	7,569.00	7,693.00	7,723.00
160	A	7,433.50	7,496.50	7,593.50	7,656.50
160	B	7,478.50	7,541.50	7,638.50	7,701.50
160	C	7,526.00	7,589.00	7,686.00	7,749.00
161	A	7,114.00	7,177.00	7,275.00	7,338.00
161	B	7,149.00	7,212.00	7,310.00	7,373.00
161	C	7,180.50	7,247.00	7,341.50	7,408.00
161	D	7,219.00	7,282.00	7,380.00	7,443.00
161	E	7,239.00	7,302.00	7,400.00	7,463.00
161	F	7,274.00	7,337.00	7,435.00	7,498.00
161	G	7,309.00	7,372.00	7,470.00	7,533.00
161	H	7,344.00	7,407.00	7,505.00	7,568.00
161	I	7,414.00	7,484.00	7,575.00	7,645.00
161	J	7,449.00	7,512.00	7,610.00	7,673.00
161	K	7,484.00	7,547.00	7,645.00	7,708.00
161	L	7,519.00	7,582.00	7,680.00	7,743.00
161	M	7,539.00	7,602.00	7,700.00	7,763.00
161	N	7,574.00	7,637.00	7,735.00	7,798.00
161	O	7,609.00	7,672.00	7,770.00	7,833.00
161	P	7,644.00	7,707.00	7,805.00	7,868.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
161 **NOTE** This is special requirements;	Q	7,128.00	7,184.00	7,289.00	7,345.00
161 **NOTE** This is special requirements;	R	7,212.00	7,268.00	7,373.00	7,429.00
161 **NOTE** This is special requirements;	S	7,508.50	7,568.00	7,669.50	7,729.00
168	A	7,443.00	7,499.00	7,611.00	7,667.00
168	B	7,485.00	7,541.00	7,653.00	7,709.00
168	C	7,527.00	7,583.00	7,695.00	7,751.00
168	D	7,110.50	7,170.00	7,278.50	7,338.00
168	E	7,163.00	7,205.00	7,331.00	7,373.00
168	F	7,198.00	7,236.50	7,366.00	7,404.50
168	G	7,226.00	7,261.00	7,394.00	7,429.00
196	A	7,093.00	7,177.00	7,289.00	7,373.00
196	B	7,149.00	7,233.00	7,345.00	7,429.00
196	C	7,205.00	7,261.00	7,401.00	7,457.00
245	A	7,400.00	7,484.00	7,645.00	7,729.00
245	B	7,484.00	7,568.00	7,729.00	7,813.00
245	C	7,568.00	7,652.00	7,813.00	7,897.00

8 GHz Frequency Band

Table 1-59 lists the information about the 8 GHz frequency band.

Table 1-59 Information about the 8 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
119/126	A	8,279.00	8,321.00	8,398.00	8,440.00
119/126	B	8,307.00	8,349.00	8,426.00	8,468.00
119/126	C	8,335.00	8,377.00	8,454.00	8,496.00
151.614	A	8,203.00	8,271.00	8,355.00	8,423.00
151.614	B	8,240.00	8,308.00	8,392.00	8,460.00
151.614	C	8,277.00	8,345.00	8,429.00	8,497.00
208	A	8,043.00	8,113.00	8,251.00	8,321.00
208	B	8,099.00	8,169.00	8,307.00	8,377.00
208	C	8,155.00	8,225.00	8,363.00	8,433.00
208	D	8,211.00	8,281.00	8,419.00	8,489.00
266	A	7,905.00	8,024.00	8,171.00	8,290.00
266	B	8,017.00	8,136.00	8,283.00	8,402.00
310	A	7,905.00	8,017.00	8,215.00	8,327.00
310	B	8,017.00	8,129.00	8,327.00	8,439.00
310	C	8,129.00	8,185.00	8,439.00	8,495.00
311.32	A	7,731.00	7,867.00	8,042.00	8,178.00
311.32	B	7,835.00	7,971.00	8,146.00	8,282.00

11 GHz Frequency Band

Table 1-60 lists the information about the 11 GHz frequency band.

Table 1-60 Information about the 11 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
500/490	A	10,700.00	10,980.00	11,200.00	11,480.00
500/490	B	10,920.00	11,200.00	11,420.00	11,700.00
530/520	A	10,675.00	10,975.00	11,205.00	11,505.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
530/520	B	10,915.00	11,215.00	11,445.00	11,745.00

13 GHz Frequency Band

Table 1-61 lists the information about the 13 GHz frequency band.

Table 1-61 Information about the 13 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
266	A	12,751.00	12,891.00	13,017.00	13,157.00
266	B	12,863.00	12,982.00	13,129.00	13,248.00

15 GHz Frequency Band

Table 1-62 lists the information about the 15 GHz frequency band.

Table 1-62 Information about the 15 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315/322	A	14,627.00	14,746.00	14,942.00	15,061.00
315/322	B	14,725.00	14,844.00	15,040.00	15,159.00
315/322	C	14,823.00	14,942.00	15,138.00	15,257.00
420	A	14,501.00	14,725.00	14,921.00	15,145.00
420	B	14,718.00	14,928.00	15,138.00	15,348.00
490	A	14,403.00	14,634.00	14,893.00	15,124.00
490	B	14,627.00	14,858.00	15,117.00	15,348.00
644	A	14,400.00	14,708.00	15,044.00	15,352.00
728	A	14,500.00	14,625.00	15,228.00	15,353.00

18 GHz Frequency Band

Table 1-63 lists the information about the 18 GHz frequency band.

Table 1-63 Information about the 18 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	A	17,685.00	18,230.00	18,695.00	19,240.00
1010/1008	B	18,180.00	18,700.00	19,190.00	19,710.00
1560	C	17,700.00	18,140.00	19,260.00	19,700.00
1092.5	A	17,712.50	18,060.00	18,805.00	19,152.50
1092.5	B	17,987.50	18,595.00	19,080.00	19,687.50

23 GHz Frequency Band

Table 1-64 lists the information about the 23 GHz frequency band.

Table 1-64 Information about the 23 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	21,990.50	22,330.00	22,998.50	23,338.00
1008	B	22,260.00	22,610.00	23,268.00	23,618.00
1050	A	21,950.25	22,498.00	23,000.25	23,548.00
1200	A	21,200.00	21,600.00	22,400.00	22,800.00
1200	B	21,600.00	22,000.00	22,800.00	23,200.00
1200	C	21,950.00	22,400.00	23,150.00	23,600.00
1232	A	21,200.00	21,786.00	22,432.00	23,018.00
1232	B	21,779.00	22,386.00	23,011.00	23,618.00

26 GHz Frequency Band

Table 1-65 lists the information about the 26 GHz frequency band.

Table 1-65 Information about the 26 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	24,549.00	24,885.00	25,557.00	25,893.00
1008	B	24,829.00	25,165.00	25,837.00	26,173.00
1008	C	25,109.00	25,445.00	26,117.00	26,453.00

28 GHz Frequency Band

Table 1-66 lists the information about the 28 GHz frequency band.

Table 1-66 Information about the 28 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	27,520.00	28,025.00	28,528.00	29,033.00
1008	B	27,968.00	28,473.00	28,976.00	29,481.00

32 GHz Frequency Band

Table 1-67 lists the information about the 32 GHz frequency band.

Table 1-67 Information about the 32 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
812	A	31,815.00	32,207.00	32,627.00	33,019.00
812	B	32,179.00	32,571.00	32,991.00	33,383.00

38 GHz Frequency Band

Table 1-68 lists the information about the 38 GHz frequency band.

Table 1-68 Information about the 38 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1260	A	37,044.00	37,632.00	38,304.00	38,892.00
1260	B	37,604.00	38,192.00	38,864.00	39,452.00

1.8.4 XMC-3W ODU

This describes the technical specifications of the XMC-3W ODU.

Working Formats

Table 1-69 lists the modulation format and the channel spacing of the ODU.

Table 1-69 Working formats of the ODU (XMC-3W ODU)

Item	Specification
Modulation format	QPSK, QPSKSTRONG, 16 QAM, 16 QAMSTRONG, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 512 QAMLIGHT, 1024 QAM, 1024 QAMLIGHT, 2048 QAM and 4096 QAM
Channel spacing	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, and 56 MHz (ETSI) 10 MHz, 20 MHz, 30 MHz, 40 MHz, 50MHz (FCC)

NOTE

- The channel spacings supported by XMC-3W ODU complies with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz and 55 MHz, which corresponds to 14 MHz, 28 MHz and 56 MHz in most application scenarios.
- The 3.5 MHz bandwidth can be implemented only when the IS3 mode of the intermediate frequency (IF) board is supports the modulation mode of QPSK and 16 QAM.
- The 4096 QAM can be implemented only when the IS6 mode of the intermediate frequency (IF) board is used and under the normal temperature condition; 4096 QAM supports only Channel spacing is 28 MHz, 40 MHz and 56 MHz; 4096QAM is supported only when the AM function is supported. ATPC is not supported.
- The cable length requirements for the 4096 QAM in the 7 GHz, 8 GHz, 13 GHz, 15GHz, 18 GHz, 23GHz working frequencies are as follows: If the Channel spacing is 40 MHz or 56 MHz, the cable length must be less than 30 m or greater than 80 m.
- The XMC-3W ODU supports channel spacings that comply with the FCC standard when working at the 15 GHz frequency band. In addition, only the ISM6/CSHR board provides this support working in IS3 mode.

Frequency Bands

Table 1-70 list the working frequency bands of the ODU.

Table 1-70 Working frequency bands of the ODU (XMC-3W ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
7 GHz	From 7.093 to 7.897	154, 160, 161, 168, 196, 245
8 GHz	From 7.731 to 8.497	119/126, 151.614, 208, 266, 310, 311.32
13 GHz	From 12.751 to 13.248	266
15 GHz	From 14.400 to 15.358	315/322, 420, 475, 490, 644, 728
18 GHz	From 17.685 to 19.710	1010/1008, 1092.5, 1560
23 GHz	From 21.200 to 23.618	1008, 1050, 1200, 1232

Transceiver Specifications

The following table lists the transceiver specifications of the XMC-3W ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

When the receive power of the ODU is between -90 dBm and -70 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

When the receive power of the ODU is between -30 dBm and -20 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

Transceiver specifications of the XMC-3W ODU (IS3)

Table 1-71 Rated maximum TX power of the XMC-3W ODU

Item	Specification								
	QPSK/ QPSK STRONG	16 QAM /16 QAM STRONG	32 QAM	64 QAM	128 QAM	256 QAM	512 QAM /512 QAM LIGHT	1024 QAM /1024 QAM LIGHT	2048 QAM
7 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	23 dBm	23 dBm	22 dBm	20 dBm
8 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	23 dBm	23 dBm	22 dBm	20 dBm
13 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	20 dBm	19 dBm	18 dBm

Item	Specification								
	QPSK/QPSK STRONG	16 QAM/16 QAM STRONG	32 QAM	64 QAM	128 QAM	256 QAM	512 QAM/512 QAM LIGHT	1024 QAM/1024 QAM LIGHT	2048 QAM
15 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	19 dBm	19 dBm
18 GHz	24 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	20 dBm	18 dBm	17 dBm
23 GHz	24 dBm	22 dBm	22 dBm	21 dBm	21 dBm	19.5 dBm	19.5 dBm	18 dBm	18 dBm

Table 1-72 Rated minimum TX power of the XMC-3W ODU

Item	Specification								
	QPSK/QPSK STRONG	16 QAM/16 QAM STRONG	32 QAM	64 QAM	128 QAM	256 QAM	512 QAM/512 QAM LIGHT	1024 QAM/1024 QAM LIGHT	2048 QAM
7 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
8 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
23 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm

Table 1-73 Maximum RF RX power of the XMC-3W ODU

Item	Specification								
	QPSK/QPSK STRONG	**16 QAM/16 QAM STRONG**	**32 QAM**	**64 QAM**	**128 QAM**	**256 QAM**	**512 QAM/512 QAM LIGHT**	**1024 QAM/1024 QAM LIGHT**	**2048 QAM**
7 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
8 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
13GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
15GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
18GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
23GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm

Table 1-74 ATPC maximun range and Frequency stability of the XMC-3W ODU

Item	Specification	
	ATPC maximun range	**Frequency stability (from -33°C to +55°C)**
7 GHz	29 dB	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz&151.614MHz, the frequency tolerance meets the requirement of the ETSI.
8 GHz		
13 GHz	33 dB	
15 GHz		
18 GHz	34 dB	
23 GHz		

Transceiver specifications of the XMC-3W ODU (IS6)

Table 1-75 Rated maximum TX power of the XMC-3W ODU

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	23 dBm	23 dBm	22 dBm	20 dBm	19 dBm
8 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	23 dBm	23 dBm	22 dBm	20 dBm	19 dBm
13 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	20 dBm	19 dBm	18 dBm	17 dBm
15 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	19 dBm	19 dBm	18 dBm
18 GHz	24 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	20 dBm	18 dBm	17 dBm	17 dBm
23 GHz	24 dBm	22 dBm	22 dBm	21 dBm	21 dBm	19.5 dBm	19.5 dBm	18 dBm	18 dBm	17 dBm

Table 1-76 Rated minimum TX power of the XMC-3W ODU

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
8 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
23 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm

Table 1-77 Maximum RF RX power of the XMC-3W ODU

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
8 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm

Table 1-78 ATPC maximun range and Frequency stability of the XMC-3W ODU

Item	Specification	
	ATPC maximun range	**Frequency stability (from -33°C to +55°C)**
7 GHz	29 dB	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz&151.614MHz, the frequency stability meets the requirement of the ETSI.
8 GHz		
13 GHz	33 dB	
15 GHz		
18 GHz	34 dB	
23 GHz		

Transceiver specifications of the XMC-3W ODU (IS8)

Table 1-79 Rated maximum TX power of the XMC-3W ODU

Item	Specification									
	QPSK/QPSKSTRONG	**16QAM/16QAMSTRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**
7 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	23 dBm	23 dBm	22 dBm	20 dBm	19 dBm
8 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	23 dBm	23 dBm	22 dBm	20 dBm	19 dBm
13 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	20 dBm	19 dBm	18 dBm	17 dBm
15 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	19 dBm	19 dBm	18 dBm
18 GHz	24 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	20 dBm	18 dBm	17 dBm	17 dBm
23 GHz	24 dBm	22 dBm	22 dBm	21 dBm	21 dBm	19.5 dBm	19.5 dBm	18 dBm	18 dBm	17 dBm

Table 1-80 Rated minimum TX power of the XMC-3W ODU

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
8 GHz	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm	5 dBm
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm
23 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm

Table 1-81 Maximum RF RX power of the XMC-3W ODU

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
7 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
8 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm

Item	Specification									
	QPSK/QPSKSTRONG	16QAM/16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm

Table 1-82 ATPC maximun range and Frequency stability of the XMC-3W ODU

Item	Specification	
	ATPC maximun range	Frequency stability (from -33°C to +55°C)
7 GHz	29 dB	≤ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz&151.614 MHz, the frequency stability meets the requirement of the ETSI.
8 GHz		
13 GHz	33 dB	
15 GHz		
18 GHz	34 dB	
23 GHz		

IF Specifications

Table 1-83 lists the IF specifications of the ODU.

Table 1-83 IF specifications of the ODU (XMC-3W ODU)

Item		Specification
IF signal	Center frequency of the input IF	350 MHz
	Center frequency of the RX IF	140 MHz
	Return loss of the IF interface	< -15 dB

Item		Specification
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5 MHz
	Downlink signal	10 MHz

Integrated System Specifications

Table 1-84 list the integrated system specifications of the ODU.

Table 1-84 Integrated system specifications of the ODU (XMC-3W ODU)

Item	Specification
Integrated system dimensions	7 GHz, 8 GHz: 195 mm x 70 mm x 195 mm (width x depth x height) 13 GHz, 15 GHz, 18 GHz, 23 GHz: 172 mm x 70 mm x 172 mm (width x depth x height)
Weight	7 GHz, 8GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz: ≤ 3.8 kg
Power supply	-48 V (from -36 V to -60 V) DC
Power consumption	7 GHz, 8 GHz: ≤ 30W 13 GHz, 15 GHz: ≤ 20.5W 18 GHz, 23 GHz: ≤ 24.5W

Frequency Information

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

7 GHz Frequency Band

Table 1-85 lists the information about the 7 GHz frequency band.

Table 1-85 Information about the 7 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	A	7,128.00	7,268.00	7,282.00	7,422.00
154	B	7,427.00	7,569.00	7,581.00	7,723.00
160	X	7,433.50	7,589.00	7,593.50	7,749.00
161	A	7,114.00	7,407.00	7,275.00	7,568.00
161	B	7,414.00	7,707.00	7,575.00	7,868.00
168	A	7,110.50	7,261.00	7,278.50	7,429.00
168	B	7,443.00	7,583.00	7,611.00	7,751.00
196	X	7,093.00	7,261.00	7,289.00	7,457.00
245	X	7,400.00	7,652.00	7,645.00	7,897.00

8 GHz Frequency Band

Table 1-86 lists the information about the 8 GHz frequency band.

Table 1-86 Information about the 8 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
119/126	X	8,279.00	8,377.00	8,398.00	8,496.00
151.614	X	8,203.00	8,345.00	8,355.00	8,497.00
208	X	8,043.00	8,281.00	8,251.00	8,489.00
266	X	7,905.00	8,136.00	8,171.00	8,402.00
310	X	7,905.00	8,185.00	8,215.00	8,495.00
311.32	X	7,731.00	7,971.00	8,042.00	8,282.00

13 GHz Frequency Band

Table 1-87 lists the information about the 13 GHz frequency band.

Table 1-87 Information about the 13 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
266	A	12,751.00	12,982.00	13,017.00	13,248.00

15GHz Frequency Band

Table 1-88 lists the information about the 15 GHz frequency band.

Table 1-88 Information about the 15 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315/322	A	14,627.00	14,942.00	14,942.00	15,257.00
420	A	14,501.00	14,928.00	14,921.00	15,348.00
475	A	14,500.00	14,883.00	14,975.00	15,358.00
490	A	14,403.00	14,858.00	14,893.00	15,348.00
644	A	14,400.00	14,708.00	15,044.00	15,352.00
728	A	14,500.00	14,625.00	15,228.00	15,353.00

18 GHz Frequency Band

Table 1-89 lists the information about the 18 GHz frequency band.

Table 1-89 Information about the 18 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	A	17,685.00	18,700.00	18,695.00	19,710.00
1560	A	17,700.00	18,140.00	19,260.00	19,700.00
1092.5	A	17,712.50	18,595.00	18,805.00	19,687.50

23GHz Frequency Band

Table 1-90 lists the information about the 23 GHz frequency band.

Table 1-90 Information about the 23 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	21,990.50	22,610.00	22,998.50	23,618.00
1050	A	21,950.25	22,498.00	23,000.25	23,548.00
1200	A	21,200.00	22,400.00	22,400.00	23,600.00
1232	A	21,200.00	22,386.00	22,432.00	23,618.00

1.8.5 XMC-3H ODU

This section describes the technical specifications of the XMC-3H ODU.

Working Formats

Table 1-91 lists the modulation format and the channel spacing of the ODU.

Table 1-91 Working formats of the ODU (XMC-3H ODU)

Item	Specification
Modulation format	QPSK, QPSKSTRONG, 16QAM, 16QAMSTRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAMLIGHT, 1024QAM, 1024QAMLIGHT, 2048QAM, 4096QAM, and 8192QAM
Channel spacing	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, 56 MHz, and 112 MHz

Item	Specification
NOTE ● The channel spacings supported by XMC-3H ODU comply with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz, 55 MHz and 110 MHz, which corresponds to 14 MHz, 28 MHz, 56 MHz and 112 MHz in most application scenarios. ● The 3.5 MHz bandwidth can be implemented only when the IS3 mode of the intermediate frequency (IF) board supports the modulation mode of QPSK and 16 QAM. ● The 112 MHz bandwidth can be implemented only when the IF board works in IS6 mode or IS8 mode at the 18 GHz, 23GHz, 28 GHz or 38 GHz working frequency. ● When the IF board works in IS6 mode at the 15 GHz, 18 GHz or 23 GHz working frequency, mapping between the channel spacing and supported highest modulation mode is as follows: 7 MHz – 1024QAM; 14 MHz – 2048QAM; 28 MHz to 56 MHz – 4096QAM; 112 MHz – 2048QAM. Both 4096QAM and 2048QAM support only the AM and do not support the ATPC. ● When the IF board works in IS6 mode at the 28 GHz or 38 GHz working frequency, mapping between the channel spacing and supported highest modulation mode is as follows: 7 MHz – 1024QAM; 14 MHz to 112 MHz – 2048QAM. The 2048QAM supports only the AM and does not support the ATPC. ● When the IF board works in IS8 mode at the 15 GHz, 18 GHz, 23 GHz, 28 GHz or 38 GHz working frequency, mapping between the channel spacing and supported highest modulation mode is as follows: 7 MHz – 1024QAM, the 1024QAM@23GHz supports only the AM and do not support the ATPC; 14 MHz – 2048QAM, the 2048QAM supports only the AM and do not support the ATPC; 28 MHz to 56 MHz – 8192QAM, the 4096QAM and 8192QAM support only the AM and do not support the ATPC; 112 MHz – 4096QAM, the 4096QAM supports only the AM and do not support the ATPC. ● A 4096QAM cable used by an extended ISM6 board works in IS6 mode must be shorter than 30 m or longer than 80 m when the channel spacing is 40 MHz or 56 MHz. ● A 2048QAM cable used by an extended ISM6 board works in IS6 mode must be shorter than 12 m or longer than 60 m when the channel spacing is 112 MHz.

Frequency Bands

Table 1-92 list the working frequency bands of the ODU.

Table 1-92 Working frequency bands of the ODU (XMC-3H ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
15 GHz	14.400 to 15.358	315/322, 420, 490, 644, 728
18 GHz	17.685 to 19.710	1010/1008, 1092.5, 1560
23 GHz	21.200 to 23.618	1008, 1050, 1200, 1232
28 GHz	27.520 to 29.481	1008
38 GHz	37.044 to 40.105	1260

Transceiver Specifications

The following table lists the transceiver specifications of the XMC-3H ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB; The maximum error between the actual transmit power of the 38 GHz -8 dBm to 1 dBm and the preset transmit power on the NMS is ±3 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

When the receive power of the ODU is between -90 dBm and -70 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

When the receive power of the ODU is between -30 dBm and -20 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

Transceiver specifications of the XMC-3H ODU (IS3)

Table 1-93 Rated maximum TX power of the XMC-3H ODU

Item	Specification									
	QPSK/ QPSKSTRONG	**16QAM/ 16QAMSTRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM/ 512QAMLIGHT**	**1024QAM**	**1024QAMLIGHT**	**2048QAM**
15 GHz	30 dBm[a]	28 dBm	28 dBm	27 dBm	27 dBm	26 dBm	26 dBm	24 dBm	23 dBm	23 dBm
18 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	24 dBm	24 dBm	22 dBm	21 dBm	21 dBm
23 GHz	28 dBm	25 dBm	25 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	20 dBm	20 dBm
28 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm	17 dBm
38 GHz	22 dBm	20 dBm	20 dBm	19 dBm	19 dBm	18 dBm	18 dBm	16 dBm	15 dBm	15 dBm

NOTE
a: 28/40/56 MHz@15 GHz, the rated maximum Tx power is reduced by 2 dB compared to the value in the table.

Table 1-94 Rated minimum TX power of the XMC-3H ODU

Item	Specification								
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAMLIGHT	1024QAM / 1024QAMLIGHT	2048QAM
15 GHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm
18 GHz	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm
23 GHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm
28 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm
38 GHz	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	1 dBm

Table 1-95 Maximum RF RX power of the XMC-3H ODU

Item	Specification								
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAMLIGHT	1024QAM / 1024QAMLIGHT	2048QAM
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
28 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm
38 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm

Table 1-96 ATPC maximum range and Frequency stability of the XMC-3H ODU

Item	Specification	
	ATPC maximum range	**Frequency stability (from -33°C to +55°C)**
15 GHz	36 dB	≤ ±5 ppm
18 GHz	35 dB	
23 GHz	36 dB	
28 GHz	33 dB	
38 GHz	30 dB	

Transceiver specifications of the XMC-3H ODU (IS6)

Table 1-97 Rated maximum TX power of the XMC-3H ODU

Item	Specification									
	QPSK/ QPSKSTRONG	**16QAM/ 16QAMSTRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**
15 GHz	30 dBm[a]	28 dBm	28 dBm	27 dBm	27 dBm	26 dBm	26 dBm	24 dBm	24 dBm	23 dBm
18 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	24 dBm	24 dBm	22 dBm	22 dBm	21 dBm
18 GHz (112 MHz)	24 dBm	22 dBm	19 dBm	17 dBm	17 dBm	16 dBm	15 dBm	15 dBm	14 dBm	-
23 GHz	28 dBm	25 dBm	5 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	21 dBm	20 dBm
23 GHz (112 MHz)	23 dBm	21 dBm	19 dBm	17 dBm	17 dBm	16 dBm	14 dBm	13 dBm	12 dBm	-
28 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm	-

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
28 GHz (112 MHz)	21 dBm	18 dBm	16 dBm	15 dBm	15 dBm	14 dBm	14 dBm	13 dBm	11 dBm	-
38 GHz	22 dBm	20 dBm	20 dBm	19 dBm	19 dBm	18 dBm	18 dBm	16 dBm	16 dBm	-
38 GHz (112 MHz)	18 dBm	17 dBm	15 dBm	13 dBm	13 dBm	12 dBm	10 dBm	8 dBm	7 dBm	-
NOTE a: 28/40/56 MHz@15 GHz, the rated maximum Tx power is reduced by 2 dB compared to the value in the table.										

Table 1-98 Rated minimum TX power of the XMC-3H ODU

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
15 GHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm
18 GHz	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm
18 GHz (112 MHz)	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	-
23 GHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
23 GHz (112 MHz)	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	-
28 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-
28 GHz (112 MHz)	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-
38 GHz	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	1 dBm	-
38 GHz (112 MHz)	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	4 dBm	-

Table 1-99 Maximum RF RX power of the XMC-3H ODU

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm
28 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
38 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-

Table 1-100 ATPC maximum range and Frequency stability of the XMC-3H ODU

Item	Specification	
	ATPC maximum range	Frequency stability (from -33°C to +55°C)
15 GHz	36 dB	≤ ±5 ppm
18 GHz	35 dB	
23 GHz	36 dB	
28 GHz	33 dB	
38 GHz	30 dB	

Transceiver specifications of the XMC-3H ODU (IS8)

Table 1-101 Rated maximum TX power of the XMC-3H ODU

Item	Specification										
	QPSK/ QPSK STRONG	16QAM / 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM	8192QAM
15 GHz	30 dBm[a]	27 dBm	27 dBm	27 dBm	27 dBm	25 dBm	25 dBm	24 dBm	24 dBm	22 dBm	20 dBm
18 GHz	29 dBm	27 dBm	27 dBm	25 dBm	25 dBm	24 dBm	24 dBm	22 dBm	22 dBm	20 dBm	18 dBm

Item	Specification										
	QPSK/ QPSK STRONG	16QAM / 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM	8192QAM
23 GHz	28 dBm	25 dBm	25 dBm	24 dBm	24 dBm	23 dBm	23 dBm	21 dBm	21 dBm	19 dBm	17 dBm
28 GHz	23 dBm	20 dBm	20 dBm	19 dBm	19 dBm	19 dBm	19 dBm	18 dBm	17 dBm	16 dBm	14 dBm
38 GHz	22 dBm	20 dBm	20 dBm	19 dBm	19 dBm	18 dBm	18 dBm	16 dBm	16 dBm	14 dBm	12 dBm
NOTE a: 28/40/56 MHz@15 GHz, the rated maximum Tx power is reduced by 2 dB compared to the value in the table.											

Table 1-102 Rated minimum TX power of the XMC-3H ODU

Item	Specification										
	QPSK/ QPSK STRONG	16QAM / 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM	8192QAM
15 GHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm
18 GHz	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm	-2 dBm
18 GHz (112 MHz)	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	1 dBm	-
23 GHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm

Item	Specification										
	QPSK/ QPSK STRONG	**16QAM / 16QAM STRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**	**8192QAM**
23 GHz (112 MHz)	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	-
28 GHz	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm	-6 dBm
28 GHz (112 MHz)	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-
38 GHz	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	1 dBm	1 dBm	1 dBm
38 GHz (112 MHz)	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	-1 dBm	4 dBm	4 dBm	-

Table 1-103 Maximum RF RX power of the XMC-3H ODU

Item	Specification										
	QPSK/ QPSK STRONG	**16QAM / 16QAM STRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**	**8192QAM**
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm	-35 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm	-35 dBm

Item	Specification										
	QPSK/QPSKSTRONG	16QAM/16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM	8192QAM
23 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm	-35 dBm
28 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm	-35 dBm
38 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm	-25 dBm	-30 dBm	-35 dBm	-35 dBm

Table 1-104 ATPC maximum range and Frequency stability of the XMC-3H ODU

Item	Specification	
	ATPC maximum range	Frequency stability (from -33°C to +55°C)
15 GHz	36 dB	≤ ±5 ppm
18 GHz	35 dB	
23 GHz	36 dB	
28 GHz	33 dB	
38 GHz	30 dB	

IF Specifications

Table 1-105 lists the IF specifications of the ODU.

Table 1-105 IF specifications of the ODU (XMC-3H ODU)

Item		Specification
IF signal	Center frequency of the input IF	350 MHz (in IS3/IS6 mode) 350 MHz or 550 MHz (in IS8 mode)
	Center frequency of the RX IF	140 MHz (in IS3/IS6 mode) 140 MHz or 177 MHz (in IS8 mode)

Item		Specification
	Return loss of the IF interface	< -15 dB (140 MHz or 350 MHz IF) < -13 dB (177 MHz or 550 MHz IF)
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5 MHz
	Downlink signal	10 MHz

Integrated System Specifications

Table 1-106 list the integrated system specifications of the ODU.

Table 1-106 Integrated system specifications of the ODU (XMC-3H ODU)

Item	Specification
Integrated system dimensions	210 mm x 49.5 mm x 210 mm (width x depth x height)
Weight	≤ 3.5 kg
Power supply	-48 V (from -36 V to -60 V) DC
Power consumption	15 GHz: ≤ 37 W 18 GHz: ≤ 40 W 23 GHz: ≤ 34 W 28 GHz: ≤ 26.5 W 38 GHz: ≤ 32 W

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

15GHz Frequency Band

Table 1-107 lists the information about the 15 GHz frequency band.

Table 1-107 Information about the 15 GHz frequency band (XMC-3H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315/322	A	14,627.00	14,746.00	14,942.00	15,061.00
315/322	B	14,725.00	14,844.00	15,040.00	15,159.00
315/322	C	14,823.00	14,942.00	15,138.00	15,257.00
420	A	14,501.00	14,725.00	14,921.00	15,145.00
420	B	14,718.00	14,928.00	15,138.00	15,348.00
490	A	14,403.00	14,634.00	14,893.00	15,124.00
490	B	14,627.00	14,858.00	15,117.00	15,348.00
644	A	14,400.00	14,708.00	15,044.00	15,352.00
728	A	14,500.00	14,625.00	15,228.00	15,353.00

18 GHz Frequency Band

Table 1-108 shows the information about sub-band combination of 18GHz frequency band.

Table 1-108 Frequency information of the 18 GHz frequency band (XMC-3H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	A	17,685.00	18,230.00	18,695.00	19,240.00
1010/1008	B	18,180.00	18,700.00	19,190.00	19,710.00
1560	C	17,700.00	18,140.00	19,260.00	19,700.00
1092.5	A	17,712.50	18,060.00	18,805.00	19,152.50
1092.5	B	17,987.50	18,595.00	19,080.00	19,687.50

23GHz Frequency Band

Table 1-109 lists the information about the 23 GHz frequency band.

Table 1-109 Information about the 23 GHz frequency band (XMC-3H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	21,990.50	22,330.00	22,998.50	23,338.00
1008	B	22,260.00	22,610.00	23,268.00	23,618.00
1050	A	21,950.25	22,498.00	23,000.25	23,548.00
1200	A	21,200.00	21,600.00	22,400.00	22,800.00
1200	B	21,600.00	22,000.00	22,800.00	23,200.00
1200	C	21,950.00	22,400.00	23,150.00	23,600.00
1232	A	21,200.00	21,786.00	22,432.00	23,018.00
1232	B	21,779.00	22,386.00	23,011.00	23,618.00

28 GHz Frequency Band

Table 1-110 lists the information about the 28 GHz frequency band.

Table 1-110 Information about the 28 GHz frequency band (XMC-3H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	27,520.00	28,025.00	28,528.00	29,033.00
1008	B	27,968.00	28,473.00	28,976.00	29,481.00

38 GHz Frequency Band

Table 1-111 lists the information about the 38 GHz frequency band.

Table 1-111 Information about the 38 GHz frequency band (XMC-3H ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1260	A	37,044.00	37,632.00	38,304.00	38,892.00
1260	B	37,604.00	38,192.00	38,864.00	39,452.00

1.8.6 XMC-5D ODU

This section describes the technical specifications of the XMC-5D ODU.

Working Formats

Table 1-112 lists the modulation format and channel spacing of the ODU.

Table 1-112 Working formats of the ODU (XMC-5D ODU)

Item	Specification
Modulation format	QPSK/QPSKSTRONG/16QAM/16QAMSTRONG/32QAM/64QAM/128QAM/256QAM/512QAM/512QAMLIGHT/1024QAM/1024QAMLIGHT/2048QAM/4096QAM
Channel spacing	7MHz/14MHz/28MHz/40MHz/56MHz/112MHz

Item	Specification
NOTE ● The channel spacings supported by XMC-5D ODU comply with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75 MHz, 27.5 MHz, 55 MHz and 110 MHz, which corresponds to 14 MHz, 28 MHz, 56 MHz and 112 MHz in most application scenarios. ● When CA is configured for the XMC-5D ODU, the same bandwidth, modulation format, and transmit power must be configured for the sub-carriers of a single-channel CA. Only the 14/28/40/56 MHz at 13/15 GHz support CA. ● Non-CA configuration: In IS3 mode at 13/15 GHz frequency band, when the channel spacing is 7 MHz, the maximum modulation format is 256QAM. When the channel spacing is 14 MHz, the maximum modulation format is 1024QAM Light. When the channel spacing is between 28 MHz and 56 MHz, the maximum modulation format is 2048QAM. Non-CA configuration: In IS6 mode at 13/15 GHz frequency band, when the channel spacing is 7 MHz, the maximum modulation format is 256QAM. When the channel spacing is 14 MHz, the maximum modulation format is 2048QAM. When the channel spacing is between 28 MHz and 56 MHz, the maximum modulation format is 4096QAM. The 4096QAM supports only the AM function, but does not support the ATPC function. Non-CA configuration: In IS8 mode at 13/15 GHz frequency band, when the channel spacing is 7 MHz, the maximum modulation format is 256QAM. When the channel spacing is 14 MHz, the maximum modulation format is 2048QAM. When the channel spacing is between 28 MHz and 56 MHz, the maximum modulation format is 4096QAM. The 4096QAM supports only the AM function, but does not support the ATPC function. ● Non-CA configuration: In IS3 mode at 18 GHz frequency band, when the channel spacing is 7 MHz, the maximum modulation format is 256QAM. When the channel spacing is 14 MHz, the maximum modulation format is 1024QAM Light. When the channel spacing is between 28 MHz and 56 MHz, the maximum modulation format is 2048QAM. Non-CA configuration: In IS6 mode at 18 GHz frequency band, when the channel spacing is 7 MHz, the maximum modulation format is 256QAM. When the channel spacing is 14 MHz, the maximum modulation format is 2048QAM. When the channel spacing is between 28 MHz and 112 MHz, the maximum modulation format is 2048QAM. The 2048QAM supports only the AM function, but does not support the ATPC function. Non-CA configuration: In IS8 mode at 18 GHz frequency band, when the channel spacing is 7 MHz, the maximum modulation format is 256QAM. When the channel spacing is 14/28/40/56/112 MHz, the maximum modulation format is 2048QAM. The 2048QAM supports only the AM function, but does not support the ATPC function. ● CA configuration: In IS8 mode, when the channel spacing is 14/28/40/56 MHz, the maximum modulation format is 2048QAM. The 2048QAM supports only the AM function, but does not support the ATPC function. ● A 4096QAM cable used by an extended ISM6 board works in IS6 mode must be shorter than 30 m or longer than 80 m when the channel spacing is 40 MHz or 56 MHz. ● A 2048QAM cable used by an extended ISM6 board works in IS6 mode must be shorter than 12 m or longer than 60 m when the channel spacing is 112 MHz. ● For details about the CA, see the **CA User Guide**.

Frequency Bands

Table 1-113 list the working frequency bands of the ODU.

Table 1-113 Working frequency bands of the ODU (XMC-5D ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
13 GHz	12.751~13.248	266
15GHz	14.400~15.358	315/322, 420, 490, 644, 728
18 GHz	17.685~19.710	1010/1008, 1092.5, 1560

Transceiver Specifications

The following table lists the transceiver specifications of the XMC-5D ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

When the receive power of the ODU is between -90 dBm and -70 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

When the receive power of the ODU is between -30 dBm and -20 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±3 dB.

Transceiver specifications of the XMC-5D ODU (IS3)

Table 1-114 Rated maximum TX power of the XMC-5D ODU

Item	Specification								
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAMLIGHT	1024QAM / 1024QAMLIGHT	2048QAM
13 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm
15 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm
18 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	19 dBm

Table 1-115 Rated minimum TX power of the XMC-5D ODU

Item	Specification								
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAMLIGHT	1024QAM / 1024QAMLIGHT	2048QAM
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm

Table 1-116 Maximum RF RX power of the XMC-5D ODU

Item	Specification								
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/ 512QAMLIGHT	1024QAM / 1024QAMLIGHT	2048QAM
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm

Table 1-117 ATPC maximum range and frequency stability of the XMC-5D ODU

Item	Specification	
	ATPC maximum range	Frequency stability (from -33°C to +55°C)
13 GHz	34 dB	≤±5ppm
15 GHz	34 dB	

Item	Specification	
	ATPC maximum range	Frequency stability (from -33°C to +55°C)
18 GHz	35 dB	

Transceiver specifications of the XMC-5D ODU (IS6)

Table 1-118 Rated maximum TX power of the XMC-5D ODU

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
13 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm	19 dBm
15 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm	19 dBm
18 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	19 dBm	-

Table 1-119 Rated minimum TX power of the XMC-5D ODU

Item	Specification									
	QPSK/ QPSK STRONG	16QAM/ 16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
13 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
18 GHz (112 MHz)	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-

Table 1-120 Maximum RF RX power of the XMC-5D ODU

Item	Specification									
	QPSK/QPSK STRONG	16QAM/16QAM STRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
13 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm
15 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm
18 GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-

Table 1-121 ATPC maximum range and frequency stability of the XMC-5D ODU

Item	Specification	
	ATPC maximum range	Frequency stability (from -33°C to +55°C)
13 GHz	34 dB	≤ ±5 ppm
15 GHz	34 dB	
18 GHz	35 dB	

Transceiver specifications of the XMC-5D ODU (IS8)

Table 1-122 Rated maximum TX power of the XMC-5D ODU (without CA)

Item	Specification									
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
13 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm	19 dBm
15 GHz	26 dBm	24 dBm	24 dBm	23 dBm	23 dBm	22 dBm	21 dBm	20 dBm	19 dBm	19 dBm
18 GHz	25 dBm	23 dBm	23 dBm	22 dBm	22 dBm	21 dBm	21 dBm	20 dBm	19 dBm	-

Table 1-123 Rated maximum TX power of the XMC-5D ODU (with CA)

Item		Specification								
Frequency	Bandwidth	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM
13/15 GHz	14 MHz	17 dBm	17 dBm	17 dBm	17 dBm	17 dBm	16 dBm	15 dBm	14 dBm	13 dBm
	28 MHz	18 dBm	17 dBm	17 dBm	17 dBm	17 dBm	16 dBm	15 dBm	14 dBm	13 dBm
	56 MHz	19 dBm	17 dBm	17 dBm	17 dBm	17 dBm	16 dBm	15 dBm	14 dBm	13 dBm

Table 1-124 Rated minimum TX power of the XMC-5D ODU (without CA)

Item	Specification									
	QPSK/ QPSK STRONG	**16QAM/ 16QAM STRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**	**4096QAM**
13/15 GHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
18 GHz	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-7 dBm	-
18 GHz (112 MHz)	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-4 dBm	-

Table 1-125 Rated minimum TX power of the XMC-5D ODU (with CA)

Item		Specification								
Frequency	**Bandwidth**	**QPSK/ QPSK STRONG**	**16QAM/ 16QAM STRONG**	**32QAM**	**64QAM**	**128QAM**	**256QAM**	**512QAM**	**1024QAM**	**2048QAM**
13/15 GHz	14 to 28 MHz	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm	-5 dBm
13/15 GHz	56 MHz	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm	-3 dBm

Table 1-126 Maximum RF RX power of the XMC-5D ODU (without CA)

Item	Specification									
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM	4096QAM
13GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm
15GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-25 dBm
18GHz	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-20 dBm	-

Table 1-127 Maximum RF RX power of the XMC-5D ODU (with CA)

Item	Specification								
	QPSK/ QPSKSTRONG	16QAM/ 16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM	1024QAM	2048QAM
13GHz	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm
15GHz	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm	-23 dBm

Table 1-128 ATPC maximum range and frequency stability of the XMC-5D ODU

Item	Specification	
	ATPC maximum range	Frequency stability (from –33°C to +55°C)
13 GHz	34 dB	≤ ±5 ppm
15 GHz	34 dB	
18 GHz	35 dB	

IF Specifications

Table 1-129 lists the IF specifications of the ODU.

Table 1-129 IF specifications of the ODU (XMC-5D ODU)

Item		Specification
IF signal	Center frequency of the TX IF	350 MHz (Working on IS3/IS6 mode) 550 MHz (Working on IS8 mode)
	Center frequency of the RX IF	140 MHz (Working on IS3/IS6 mode) 177 MHz (Working on IS8 mode)
	Return loss of the IF interface	< -15 dB (140 MHz or 350 MHz IF) < -13 dB (177 MHz or 550 MHz IF)
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5MHz
	Downlink signal	10MHz

Integrated System Specifications

Table 1-130 lists the integrated system specifications of the ODU.

Table 1-130 Integrated system specifications of the ODU (XMC-5D ODU)

Item	Specification
Integrated system dimensions	210 mm x 82 mm x 210 mm (width x depth x height)
Weight	≤ 4.5 kg
Power supply	-48 V (from -36 V to -60 V) DC
Power consumption	13/15 GHz: ≤ 55 W 18 GHz: ≤ 59 W

Frequency Information

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

Table 1-131 lists the frequency information of the 13 GHz frequency band.

Table 1-131 Information about the 13 GHz frequency band (XMC-5D ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
266	A	12,751.00	12,891.00	13,017.00	13,157.00
266	B	12,863.00	12,982.00	13,129.00	13,248.00

Table 1-132 lists the frequency information of the 15 GHz frequency band.

Table 1-132 Frequency information of the 15 GHz frequency band (XMC-5D ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315A/ 322A	315A/ 322A	14,627.00	14,746.00	14,942.00	15,061.00
315B/322B	315B/ 322B	14,725.00	14,844.00	15,040.00	15,159.00
315C/ 322C/420B	315C/ 322C	14,823.00	14,942.00	15,138.00	15,257.00
	420B	14,718.00	14,928.00	15,138.00	15,348.00
420A	420A	14,501.00	14,725.00	14,921.00	15,145.00
490A	490A	14,403.00	14,634.00	14,893.00	15,124.00
490B	490B	14,627.00	14,858.00	15,117.00	15,348.00

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
644A/ 728A	644A	14,400.00	14,708.00	15,044.00	15,352.00
	728A	14,500.00	14,625.00	15,228.00	15,353.00

Table 1-133 lists the frequency information of the 18 GHz frequency band.

Table 1-133 Information about the 18 GHz frequency band (XMC-5D ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	A	17,685.00	18,230.00	18,695.00	19,240.00
1010/1008	B	18,180.00	18,700.00	19,190.00	19,710.00
1560	C	17,700.00	18,140.00	19,260.00	19,700.00
1092.5	A	17,712.50	18,060.00	18,805.00	19,152.50
1092.5	B	17,987.50	18,595.00	19,080.00	19,687.50

1.9 Environment performance

The technical specifications of the ODU consist of major reference standards, air temperature, relative humidity, earthquake, mechanical stress, and dustproof and waterproof.

Table 1-134 Environment performance of ODU

Item		ODU
Major reference standards	Operation	Compliant with ETSI EN 300 019-1-4 class 4.1
	Transportation	Compliant with ETSI EN 300 019-1-2 class 2.3
	Storage	Compliant with ETSI EN 300 019-1-1 class 1.2 **NOTE** The storage validity period for the ODU is one year.

Item		ODU
Air temperature	Operation	-33°C to +55°C
	Transportation and storage	-40°C to +70°C
Relative humidity		5% to 100%
Noise		-
Earthquake		Compliant with Bellcore GR-63-CORE ZONE 4
Mechanical stress		Compliant with ETSI EN 300 019
Dustproof and waterproof		IP55 (SP/SPA/HP/LP ODU) IP65 (XMC-3H/XMC-3W/XMC-2 ODU) IP66 (XMC-2H/XMC-3/XMC-5D ODU)

2 Hybrid coupler (Single-channel ODU)

Hybrid coupler is short for the RF signal combiner/divider. It is used to install two ODUs on one antenna. The hybrid couplers that are described in this document are the hybrid couplers adaptive to the RTN XMC ODUs.

2.1 Device Type

The hybrid couplers is available in two series: balanced hybrid coupler and unbalanced hybrid coupler.

Hybrid couplers are classified based on the attenuation values of tributary signals. The attenuation values are the same in the transmit and receive directions. The differences between the two types of hybrid coupler are as follows:

- A balanced hybrid coupler is also called a 3 dB hybrid coupler.

  The 3 dB hybrid coupler divides one channel of RF signals into two channels of RF signals of the similar power. The power of each divided channel of RF signals is approximately 50% of the original channel of RF signals. That is, the power attenuation value of each divided channel of RF signals is approximately 3 dB, as compared with the original channel of RF signals.
- An unbalanced hybrid coupler is also called a 6 dB hybrid coupler.

  The 6 dB hybrid coupler divides one channel of RF signals into two channels of RF signals of different power. The power of the channel of extension tributary signals is approximately 25% of the original channel of RF signals. That is, the power attenuation value of the channel of extension tributary signals is approximately 6 dB, as compared with the original channel of RF signals. The power of the channel of main tributary signals is approximately 75% of the original channel of RF signals. That is, the power attenuation value of the channel of main tributary signals is approximately 1.5 dB, as compared with the original channel of RF signals.

2.2 Appearance

The hybrid coupler is an outdoor three-interface network component of the wireless transmission products.

Figure 2-1 shows the appearance of the hybrid coupler.

Figure 2-1 Appearance of the hybrid coupler

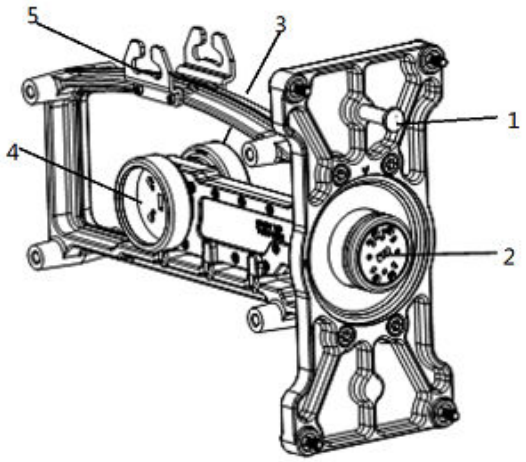


Table 2-1 describes the appearance of the hybrid coupler.

Table 2-1 Appearance description of the hybrid coupler

Number	Item	Description
1	Guide pin	Used together with the guide trough of the component connected to it to facilitate the installation of the hybrid coupler.
2	Antenna interface	See **Interfaces on the Hybrid coupler**.
3	Main tributary interface	
4	Extension tributary interface	
5	Guide trough	Used together with the ODU guide pin to facilitate the installation of the ODU.

2.3 Functions

The hybrid coupler is used to combine and divide RF signals.

The hybrid coupler has the following functions and features:

- In the TX direction, the hybrid coupler combines two routes of RF signals into one route and transmits the signals to the antenna.
- In the RX direction, the hybrid coupler divides the RF signals received from the antenna into two routes and transmits the signals to the ODU.

2.4 Working Principles

The hybrid coupler is mainly composed of waveguide cavities.

The waveguide cavity is the main component of the hybrid coupler. It has three interfaces: common interface, main tributary interface, and extension tributary interface.

The working principles of the hybrid coupler are as follows:

- In the TX direction, the RF signals received from the main tributary interface and extension tributary interface are combined into one route in the waveguide cavity and transmitted from the common interface.
- In the RX direction, the RF signals received from the common interface are divided into two routes in the waveguide cavity and transmitted from the two tributary interfaces.

2.5 Interfaces

The interfaces of the hybrid coupler consist of the antenna interface, main tributary interface, and extension tributary interface.

Figure 2-2 shows the interfaces of the hybrid coupler.

Figure 2-2 Interfaces of the hybrid coupler

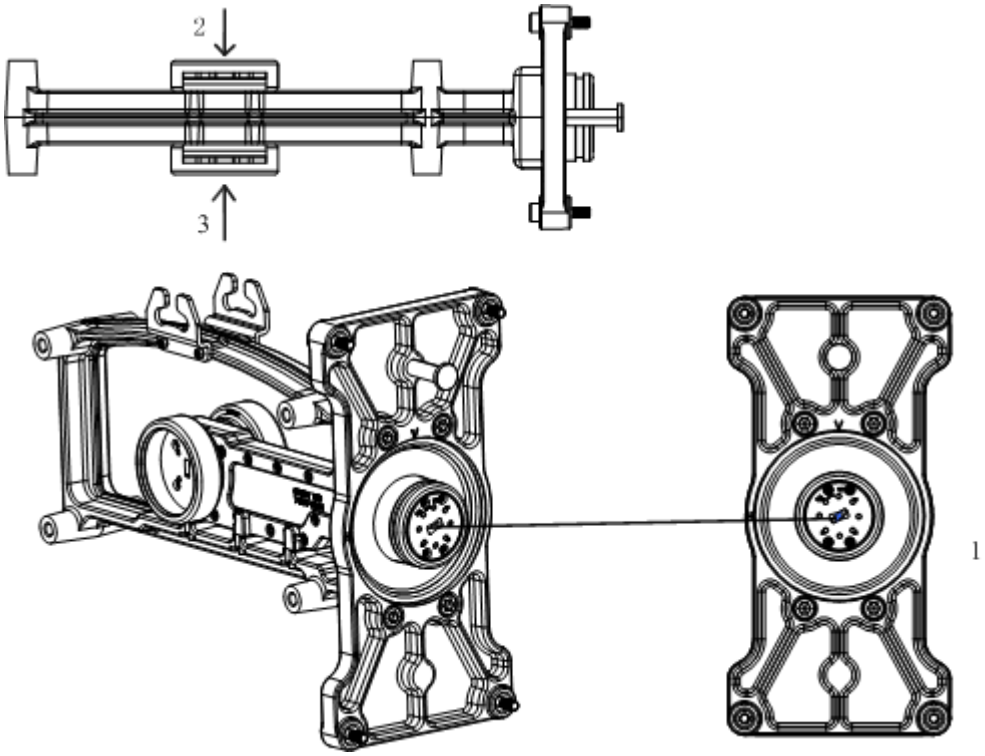


Table 2-2 describes the interfaces of the hybrid coupler.

Table 2-2 Interface description of the hybrid coupler

Serial No.	Interface Name	Interface Label	Function	Interface Type
1	Antenna interface	-	Used to connect with the antenna, antenna adapter, or flexible waveguide.	153IEC-R70, can be interconnected with the PDR70 (6 GHz frequency bands) 153IEC-R84, can be interconnected with the PBR84 (7/8 GHz frequency bands) 153IEC-R100, can be interconnected with the PBR100 (10/11 GHz frequency band) 153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band)
2	Main tributary interface	MAIN	Used to connect with the main ODU.	

Serial No.	Interface Name	Interface Label	Function	Interface Type
3	Extension tributary interface	STANDBY	Used to connect with the standby ODU.	153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18 /23/26 GHz frequency bands) 153IEC-R320, can be interconnected with the PBR320 (28/32/38 GHz frequency bands) UG 383/U-R400, can be interconnected with the UG 383/U-R400 (42 GHz frequency band)

2.6 Label

The label of the hybrid coupler is attached to the hybrid coupler and packing case to identify the basic information of the hybrid coupler.

Figure 2-3 shows the label of the hybrid coupler.

Figure 2-3 Label of the hybrid coupler

Table 2-3 describes the parameters on the label.

Table 2-3 Meaning of the hybrid coupler label

Label Information	Content of the Label	Parameter	Meaning
Hybrid coupler name	Hybrid Coupler	-	Indicates that the component is a hybrid coupler.
Hybrid coupler model	C 07 B 03 R R C ① ② ③ ④ ⑤ ⑥ ⑦	①: Component type	C indicates the hybrid coupler.
		②: Frequency band	Indicates the working frequency of the hybrid coupler (GHz). The Range of the working frequency is as follows: 6/07/10/11/13/15/18/23/26/28/32/38/42. **NOTE** 07 indicates that the working frequency of the hybrid coupler is 7 GHz or 8 GHz.
		③: Tributary features	B: Balanced U: Unbalanced
		④: Coupling	03 indicates that the coupling of the tributary is 3 dB. 06 indicates that the coupling of the tributary is 6 dB.
		⑤: Type of the antenna interface	C: Circle waveguide R: Rectangular waveguide
		⑥: Type of the ODU interface	C: Circle waveguide R: Rectangular waveguide

Label Information	Content of the Label	Parameter	Meaning
		⑦: Type of the installation interface	Matches with the RTN XMC ODU.
Hybrid coupler code (ITEM)	52440559	-	Used to uniquely identify the model of each hybrid coupler.
Hybrid coupler description (DEP)	7.125-8.5GHz ① 3dB ②	①: Range of the working frequency	Indicates the range of the working frequency of the hybrid coupler. (GHz)
		②: Coupling	Coupling of the main and extension tributaries (dB)
Hybrid coupler serial number	21524405597YD2207997	-	Used to uniquely identify each hybrid coupler.
Bar code area		-	Bar code of the hybrid coupler serial number

2.7 Technical Specifications

The technical specifications of the hybrid coupler consist of the electrical specifications and mechanical specifications.

Table 2-4 lists the technical specifications of the hybrid coupler.

Table 2-4 Technical specifications of the hybrid coupler

Type	Frequency Band	Attenuation of the main path typical(dB)	Attenuation of the standby path typical(dB)	Minimum Isolation(dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
3 dB hybrid coupler	6 GHz	3.4	3.4	20	1.3	Can be interconnected with the PDR70
	7/8 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR84
	10 GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR100
	11 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR100
	13 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR120
	15 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR140
	18 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR220
	23 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR220
	26 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR220

Type	Frequency Band	Attenuation of the main path typical(dB)	Attenuation of the standby path typical(dB)	Minimum Isolation(dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
	28 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR320
	32 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR320
	38 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR320
	42 GHz	4.4	4.4	20	1.4	Can be interconnected with the UG383/U-R400
6 dB hybrid coupler	6 GHz	1.5	6.3	20	1.3	Can be interconnected with the PDR70
	7/8 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR84
	10 GHz	1.9	7.0	20	1.3	Can be interconnected with the PBR100
	11 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR100
	13 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR120

Type	Frequency Band	Attenuation of the main path typical(dB)	Attenuation of the standby path typical(dB)	Minimum Isolation(dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
	15 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR140
	18 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR220
	23 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR220
	26 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR220
	28 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR320
	32 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR320
	38 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR320
	42 GHz	2.1	7.5	20	1.4	Can be interconnected with the UG383/U-R400

Table 2-5 lists the mechanical specifications of the hybrid coupler.

Table 2-5 Mechanical specifications of the hybrid coupler

Power capacity (W)	8
Dimensions (mm)	420 x 300 x 180 (width x depth x height)
Weight (kg)	≤ 5

3 Flat Coupler (XMC-5D ODU)

A hybrid coupler is short for RF signal combiner/divider. A flat coupler is a balanced hybrid coupler used to combine and divide two channels of the same XMC-5D ODU. With a flat coupler, a single XMC-5D ODU can be installed on one antenna in direct mounting mode.

3.1 Appearance

The flat coupler is an outdoor three-interface network component of the wireless transmission products.

Figure 3-1 shows the appearance of the flat coupler.

Figure 3-1 Appearance of the flat coupler

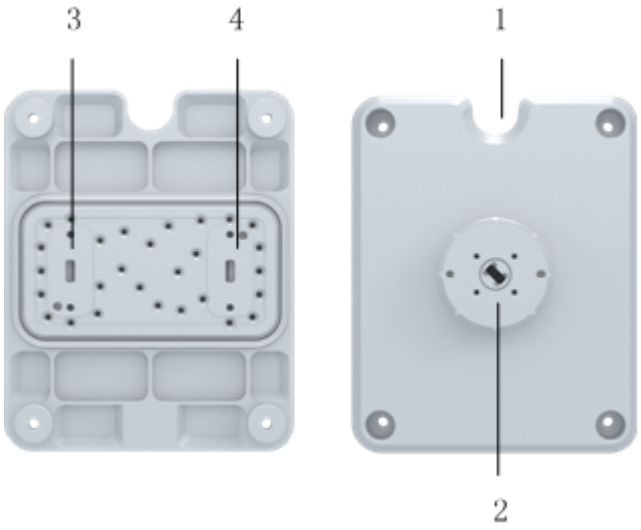


Table 3-1 describes the appearance of the flat coupler.

Table 3-1 Appearance description of the hybrid coupler

Number	Item	Description
1	Guide pin	Used together with the guide pin of the ODU to facilitate the installation of the ODU.
2	Antenna interface	See **Interfaces on the Hybrid coupler**.
3	Main tributary interface	
4	Extension tributary interface	

3.2 Functions

The flat coupler is used to combine and divide RF signals.

The flat coupler has the following functions and features:

- In the TX direction, the flat coupler combines two routes of RF signals on the same XMC-5D ODU into one route and transmits the signals to the antenna.
- In the RX direction, the flat coupler divides the RF signals received from the antenna into two routes and transmits the signals to the two RF ports of the same XMC-5D ODU.

3.3 Interfaces

The interfaces of the flat coupler consist of the antenna interface, main tributary interface, and extension tributary interface.

Figure 3-2 shows the interfaces of the flat coupler.

Figure 3-2 Interfaces of the flat coupler

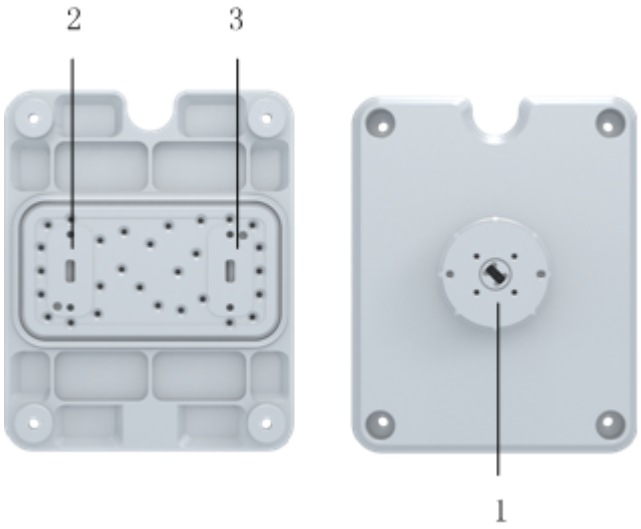


Table 3-2 describes the interfaces of the flat coupler.

Table 3-2 Interface description of the flat coupler

Serial No.	Interface Name	Interface Label	Function	Interface Type
1	Antenna interface	-	Used to connect with the antenna.	153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band) 153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18 GHz frequency bands)
2	Main tributary interface	MAIN	Used to connect with the RF1 port of the XMC-5D ODU.	153IEC-R140, can be interconnected with the PBR140 (13/15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18 GHz frequency bands)
3	Extension tributary interface	STANDBY	Used to connect with the RF2 port of the XMC-5D ODU.	

3.4 Label

The label of the flat coupler is attached to the flat coupler and packing case to identify the basic information of the flat coupler.

Figure 3-3 shows the label of the flat coupler.

Figure 3-3 Label of the flat coupler

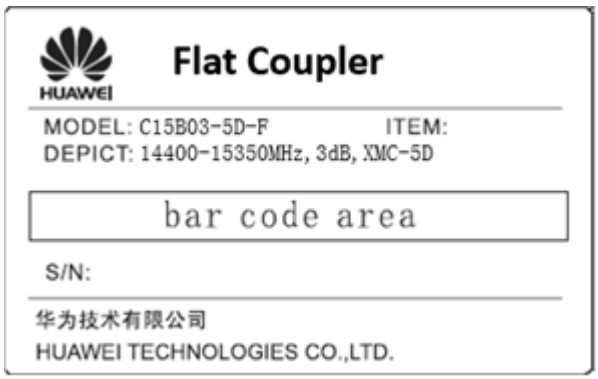


Table 3-3 describes the parameters on the label.

Table 3-3 Meaning of the flat coupler label

Label Information	Content of the Label	Parameter	Meaning
Flat coupler name	Flat Coupler	-	Indicates that the component is a flat coupler.
Flat coupler model	C15B03-5D-F ①②③④ ⑤ ⑥	①: Component type	C indicates the coupler.
		②: Frequency band	Indicates the working frequency of the flat coupler (GHz). The Range of the working frequency is as follows: 13/15/18.
		③: Tributary features	B: Balanced

Label Information	Content of the Label	Parameter	Meaning
		④: Coupling	03 indicates that the coupling of the tributary is 3 dB.
		⑤: Type of the applicable ODU	5D: XMC-5D ODU is applicable
		⑥: Type of the coupler	F: Flat coupler
Flat coupler code (ITEM)	ITEM:	-	Used to uniquely identify the model of each flat coupler.
Flat coupler description (DEP)	14400-15350MHz, 3dB, XMC-5D ① ② ③	①: Range of the working frequency	Indicates the range of the working frequency of the flat coupler.
		②: Coupling	Coupling of the main and extension tributaries
		③: Applicable ODU Type	XMC-5D: XMC-5D ODU is applicable
Flat coupler serial number	S/N:	-	Used to uniquely identify each flat coupler.
Bar code area	bar code area	-	Bar code of the flat coupler serial number

3.5 Technical Specifications

The technical specifications of the flat coupler consist of the electrical specifications and mechanical specifications.

Table 3-4 lists the technical specifications of the flat coupler.

Table 3-4 Technical specifications of the flat coupler

Frequency Band	Attenuation of the main path typical(dB)	Attenuation of the standby path typical(dB)	Minimum Isolation(dB)	Voltage Standing Wave Ratio (VSWR)	Antenna interface Type
13 GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR120
15 GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR140
18 GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR220

Table 3-5 lists the mechanical specifications of the flat coupler.

Table 3-5 Mechanical specifications of the flat coupler

Power capacity (W)	8
Dimensions (mm)	170 x 136 x 28 (width x depth x height)
Weight (kg)	≤ 0.6

4 Dual Coupler (XMC-5D ODU)

A hybrid coupler is short for RF signal combiner/divider. Dual coupler provides the coupler function for two channels, which are independent of each other. For each channel, the coupler function is implemented between two XMC-5D ODUs. A dual coupler and a flat coupler/OMT can be used to implement direct mounting of two XMC-5D ODUs on one antenna.

4.1 Appearance

The dual coupler is an outdoor four-interface network component of the wireless transmission products.

Figure 4-1 shows the appearance of the dual coupler.

Figure 4-1 Appearance of the dual coupler

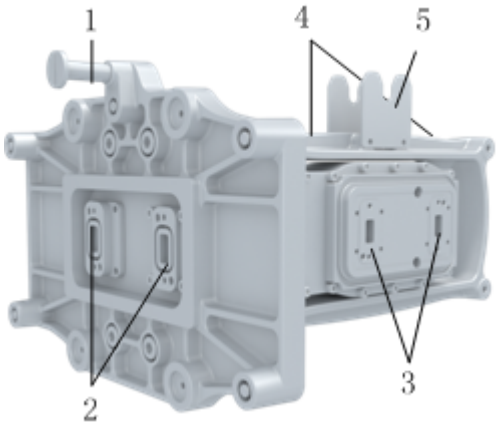


Table 4-1 describes the appearance of the dual coupler.

Table 4-1 Appearance description of the dual coupler

Number	Item	Description
1	Guide pin	Used together with the guide trough of the component connected to it to facilitate the installation of the dual coupler.
2	Antenna interface	See **Interfaces on the Hybrid coupler**.
3	Main tributary interface	
4	Extension tributary interface	
5	Guide trough	Used together with the ODU guide pin to facilitate the installation of the ODU.

4.2 Functions

A dual coupler provides the coupler function for two independent channels. For each channel, the two channels of RF signals are combined and divided between two XMC-5D ODUs.

The functions and features of dual couplers are as follows (assume that the two XMC-5D ODUs are ODU A and ODU B):

- In the transmit direction, the RF signal of the RF1 port of ODU A and the RF signal of the RF1 port of ODU B are combined into one channel of RF signals. At the same time, the RF signal of the RF2 port of ODU A and the RF signal of the RF2 port of ODU B are combined into one channel of RF signals. The two channels of signals need to be combined or adapted and then transmitted to the antenna through a flange adapter, a flat coupler, or a flat OMT.

- In the receive direction, after the RF signals received from the antenna are adapted or divided by the flange adapter, flat coupler, or flat OMT, the dual coupler divides these signals into four channels of RF signals and transmits them to the ODUs.

4.3 Working Principles

The dual coupler is mainly composed of two waveguide cavities.

The waveguide cavity is the main component of the dual coupler. It has three interfaces: common interface, main tributary interface, and extension tributary interface.

The working principles of one waveguide cavitie on the dual coupler are as follows:

- In the TX direction, the RF signals received from the main tributary interface and extension tributary interface are combined into one route in the waveguide cavity and transmitted from the common interface.
- In the RX direction, the RF signals received from the common interface are divided into two routes in the waveguide cavity and transmitted from the two tributary interfaces.

4.4 Interfaces

The interfaces of the dual coupler consist of the antenna interface, main tributary interface, and extension tributary interface.

Figure 4-2 shows the interfaces of the dual coupler.

Figure 4-2 Interfaces of the dual coupler

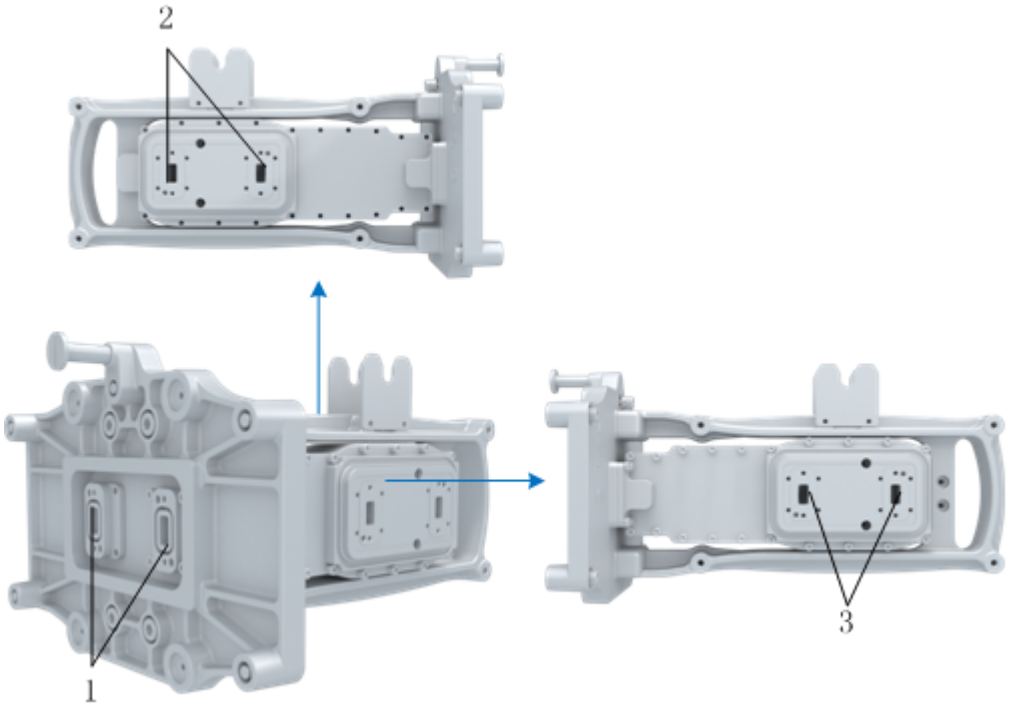


Table 4-2 describes the interfaces of the dual coupler.

Table 4-2 Interface description of the dual coupler

Serial No.	Interface Name	Interface Label	Function	Interface Type
1	Antenna interface	-	Used to connect with the flat coupler, flat OMT, or flange adapter.	153IEC-R140, can be interconnected with the PBR140 (13/15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18 GHz frequency bands) **NOTE** The antenna ports of the dual coupler can be connected to the flat coupler and then work with the single-polarized antenna to implement direct mounting; the antenna ports of the dual coupler can be connected to the flat OMT and then work with the dual-polarized antenna to implement direct mounting; the antenna ports of the dual coupler can be connected to the flange adapter and then work with the flexible waveguide and dual-polarized antenna to implement separated mounting.
2	Extension tributary interface	STANDBY	Used to connect with the main ODU.	
3	Main tributary interface	MAIN	Used to connect with the standby ODU.	

4.5 Label

The label of the dual coupler is attached to the dual coupler and packing case to identify the basic information of the dual coupler.

Figure 4-3 shows the label of the dual coupler.

Figure 4-3 Label of the dual coupler

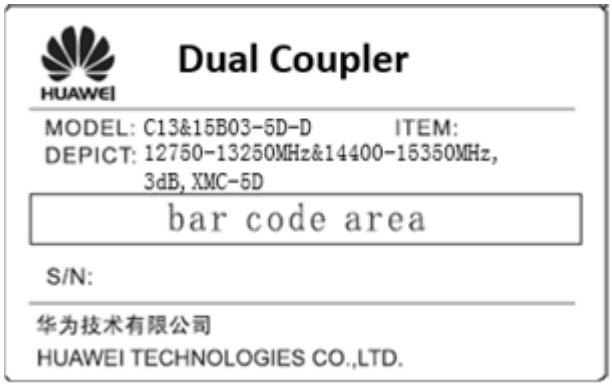


Table 4-3 describes the parameters on the label.

Table 4-3 Meaning of the dual coupler label

Label Information	Content of the Label	Parameter	Meaning
Dual coupler name	**Dual Coupler**	-	Indicates that the component is a dual coupler.
Dual coupler model	C13&15B03-5D-D ① ② ③④ ⑤ ⑥	①: Component type	C indicates the coupler.
		②: Frequency band	Indicates the working frequency of the dual coupler (GHz). The Range of the working frequency is as follows: 13&15 or 18.
		③: Tributary features	B: Balanced U: Unbalanced
		④: Coupling	03 indicates that the coupling of the tributary is 3 dB. 06 indicates that the coupling of the tributary is 6 dB.

Label Information	Content of the Label	Parameter	Meaning
		⑤: Type of the applicable ODU	5D: XMC-5D ODU is applicable.
		⑥: Type of the coupler	D: Dual coupler
Dual coupler code (ITEM)	ITEM:	-	Used to uniquely identify the model of each dual coupler.
Dual coupler description (DEP)	12750-13250MHz&14400-15350MHz, 3dB, XMC-5D ① ② ③	①: Range of the working frequency	Indicates the range of the working frequency of the dual coupler.
		②: Coupling	Coupling of the extension tributaries
		③: Type of the applicable ODU	XMC-5D: XMC-5D ODU is applicable.
Dual coupler serial number	S/N:	-	Used to uniquely identify each dual coupler.
Bar code area	bar code area	-	Bar code of the dual coupler serial number

4.6 Technical Specifications

The technical specifications of the dual coupler consist of the electrical specifications and mechanical specifications.

Table 4-4 lists the technical specifications of the dual coupler.

Table 4-4 Technical specifications of the dual coupler

Type	Frequency Band	Attenuation of the main path typical(dB)	Attenuation of the standby path typical(dB)	Minimum Isolation(dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
3 dB hybrid coupler	13&15 GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR140
	18 GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR220
6 dB hybrid coupler	13&15 GHz	1.9	7	20	1.3	Can be interconnected with the PBR140
	18 GHz	1.9	7	20	1.3	Can be interconnected with the PBR220

Table 4-5 lists the mechanical specifications of the dual coupler.

Table 4-5 Mechanical specifications of the dual coupler

Power capacity (W)	8
Dimensions (mm)	368 x 262 x 190 (width x depth x height)
Weight (kg)	≤ 5.15

5 OMT (Single-channel ODU)

The orthogonal mode transducer (OMT) is the short name for the polarized hybrid coupler. The OMT is used when two ODUs with different polarization directions need to be installed on the same antenna.

NOTE

The OMT must be used by UHP S2D Antenna.

5.1 Functions and Features

The OMT separates V polarization from H polarization for RF signals.

- In the transmit direction, the OMT combines two ODU RF signals into one RF signal which is then transmitted to the antenna.
- In the receive direction, the OMT divides the RF signal received from the antenna into two RF signals which are then transmitted to the ODUs.

5.2 Working Principle

The OMT performs conversion between a rectangular waveguide cavity and a round waveguide cavity for dual-polarized waves, and combines/separates V-polarized waves and H-polarized waves with/from each other.

- In the transmit direction, the OMT performs conversion between a rectangular waveguide cavity and a round waveguide cavity, so that V/H-polarized waves separately from two rectangular waveguide cavities can be transmitted in the round waveguide cavity and then sent to free space by means of an antenna with a round waveguide interface.
- In the receive direction, the OMT receives V/H-polarized waves from the round waveguide interface of an antenna, separates V-polarized waves from H-polarized waves, and transmits the separated waves to appropriate rectangular waveguide cavities.

5.3 Interfaces

The OMT has three types of interfaces: antenna interface, V-polarized ODU interface, and H-polarized ODU interface.

- The antenna interface of the OMT is a round recessed waveguide interface.
- The ODU interface of the OMT is a rectangular protruding waveguide interface.

Figure 5-1 Interfaces of the Polarized Coupler

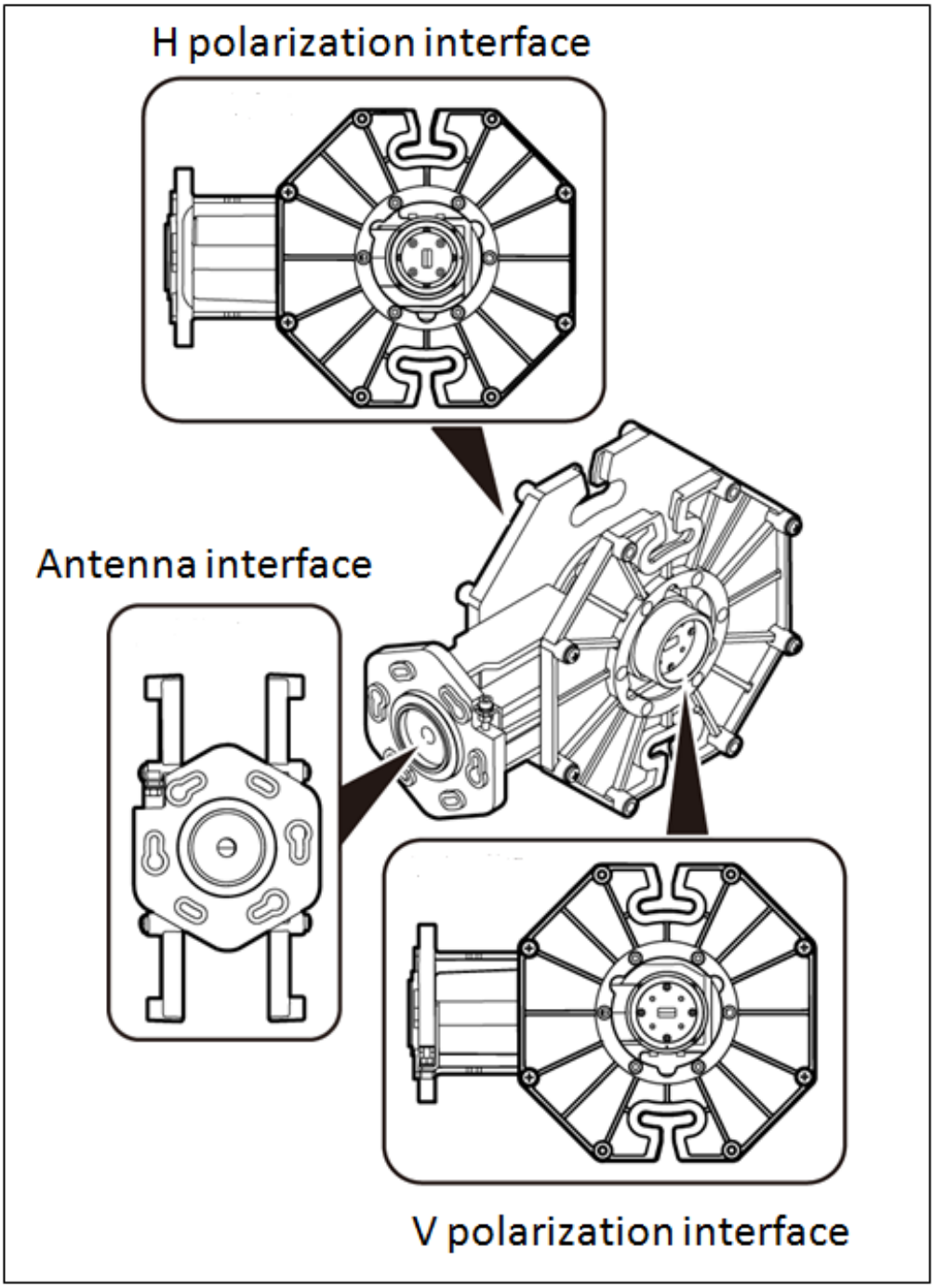


Table 5-1 Description of the interfaces of the OMT

Interface	Mark	Function	Type of Connector
Antenna interface	-	Connects to the antenna.	153IEC-R84 (7/8 GHz frequency band)

Interface	Mark	Function	Type of Connector
V-polarized ODU interface	V	Connects to the V-polarized ODU.	153IEC-R100 (10/11 GHz frequency band) 153IEC-R120 (13 GHz frequency band) 153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18/23/26 GHz frequency band) 153IEC-R320 (28/32/38 GHz frequency band)
H-polarized ODU interface	H	Connects to the H-polarized ODU.	

NOTE
The XMC-3/XMC-3W/XMC-3H ODU antenna port is of I-shaped and therefore can be interconnected to either the horizontal or vertical interface.

5.4 Technical Specifications

The technical specifications of the OMT include electrical and mechanical specifications.

Table 5-2 Electrical specifications of the OMT

Frequency Band (GHz)	Frequency Range (GHz)	Maximum Loss (dB)	VSWR	Polarization Isolation (dB)
7/8	7.125 to 8.5	0.6	1.3	35
10	10.125 to 11.7	0.4	1.3	35
11	10.7 to 11.7	0.6	1.3	35
13	12.75 to 13.25	0.6	1.3	35
15	14.4 to 15.35	0.6	1.3	35
18	17.7 to 19.7	0.6	1.3	35
23	21.2 to 23.6	0.6	1.3	35
26	24.25 to 26.5	0.8	1.3	35
28	27.5 to 29.5	0.8	1.3	35
32	31.8 to 33.4	1	1.3	35
38	37.0 to 40.0	1	1.3	35

Table 5-3 Mechanical specifications of the OMT

Weight (kg)	Dimensions
≤5.8	≤360 mm x 269 mm x 450mm (W x D x H)

6 Flat OMT (XMC-5D ODU)

OMT is short for orthogonal mode transducer. The flat OMT is used to combine the signals of two interfaces in different polarization directions of an XMC-5D ODU into one channel of signals. You can use a flat OMT to install an XMC-5D ODU on one antenna in direct mounting mode.

NOTE

Flat OMTs can be used with UHP S2D antennas or UHP modular antennas.

6.1 Functions and Features

The flat OMT separates V polarization from H polarization for RF signals.

- In the transmit direction, the flat OMT combines two channel RF signals on the same XMC-5D ODU into one RF signal which is then transmitted to the antenna.
- In the receive direction, the flat OMT divides the RF signal received from the antenna into two RF signals which are then transmitted to the two RF ports of the same XMC-5D ODU.

6.2 Working Principle

The flat OMT performs conversion between a rectangular waveguide cavity and a round waveguide cavity for dual-polarized waves, and combines/separates V-polarized waves and H-polarized waves with/from each other.

- In the transmit direction, the flat OMT performs conversion between a rectangular waveguide cavity and a round waveguide cavity, so that V/H-polarized waves separately from two rectangular waveguide cavities can be transmitted in the round waveguide cavity and then sent to free space by means of an antenna with a round waveguide interface.
- In the receive direction, the flat OMT receives V/H-polarized waves from the round waveguide interface of an antenna, separates V-polarized waves from H-polarized waves, and transmits the separated waves to appropriate rectangular waveguide cavities.

6.3 Interfaces

The flat OMT has three types of interfaces: antenna interface, V-polarized ODU interface, and H-polarized ODU interface.

- The antenna interface of the flat OMT is a round recessed waveguide interface.
- The ODU interface of the flat OMT is a rectangular protruding waveguide interface.

Figure 6-1 Interfaces of the flat OMT

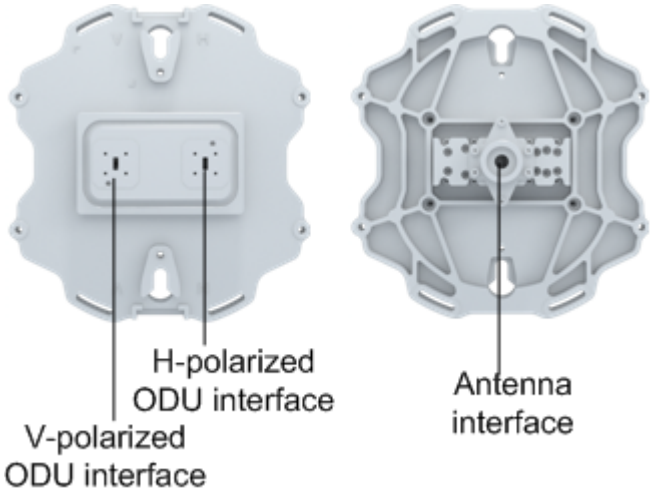


Table 6-1 Description of the interfaces of the flat OMT

Interface	Mark	Function	Type of Connector
Antenna interface	-	Connects to the antenna.	153IEC-R140 (13/15 GHz frequency band) 153IEC-R220 (18 GHz frequency band)

Interface	Mark	Function	Type of Connector
V-polarized ODU interface	V	Connects to the V-polarized interface of the XMC-5D ODU.	
H-polarized ODU interface	H	Connects to the H-polarized interface of the XMC-5D ODU.	

6.4 Label

The label of the flat OMT is attached to the flat OMT and packing case to identify the basic information of the flat OMT.

Figure 6-2 shows the label of the flat OMT.

Figure 6-2 Label of the flat OMT

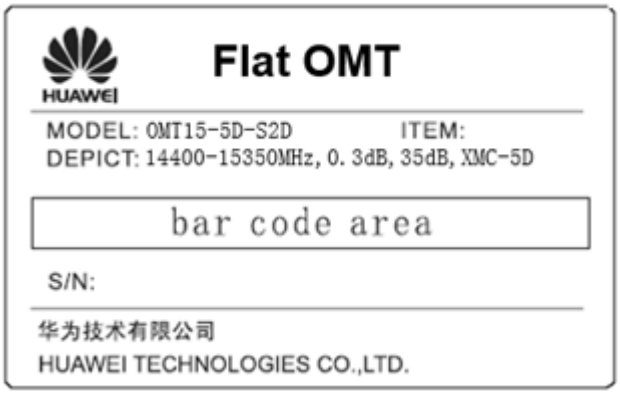


Table 6-2 describes the parameters on the label.

Table 6-2 Meaning of the flat OMT label

Label Information	Content of the Label	Parameter	Meaning
Flat OMT name	**Flat OMT**	-	Indicates that the component is a flat OMT.
Flat OMT model	OMT15-5D-S2D ① ② ③ ④	①: Component type	C indicates the coupler.

Label Information	Content of the Label	Parameter	Meaning
		②: Frequency band	Indicates the working frequency of the flat OMT (GHz). The Range of the working frequency is as follows: 13&15 or 18.
		③: Type of the applicable ODU	5D: XMC-5D ODU is applicable.
		④: Type of the applicable antenna	S2D: UHP S2D antenna is applicable. UHP-M: UHP modular antenna is applicable.
Flat OMT code (ITEM)	ITEM:	-	Used to uniquely identify the model of each flat OMT.
Flat OMT description (DEP)	14400-15350MHz, 0.3dB, 35dB, XMC-5D ① ② ③ ④	①: Range of the working frequency	Indicates the range of the working frequency of the flat OMT.
		②: Coupling	Coupling of the main and extension tributaries
		③: Type of the applicable ODU	5D: XMC-5D ODU is applicable.
		④: Type of the applicable ODU	XMC-5D: XMC-5D ODU is applicable.
Flat OMT serial number	S/N:	-	Used to uniquely identify each flat OMT.
Bar code area	bar code area	-	Bar code of the flat OMT serial number

6.5 Technical Specifications

The technical specifications of the flat OMT include electrical and mechanical specifications.

Table 6-3 Electrical specifications of the flat OMT

Frequency Band (GHz)	Frequency Range (GHz)	Maximum Loss (dB)	VSWR	Polarization Isolation (dB)
13	12.75 to 13.25	0.3	1.3	35
15	14.4 to 15.35	0.3	1.3	35
18	17.7 to 19.7	0.4	1.3	35

Table 6-4 Mechanical specifications of the OMT

Weight (kg)	Dimensions
≤ 2	≤ 272 mm x 258 mm x 70 mm (W x D x H)

7 Dual-Polarized Coupler

A dual-polarized coupler helps install four ODUs directly on one dual-polarized antenna.

NOTE

The dual-polarized coupler must be used by UHP S2D Antenna.

7.1 Functions and Features

A dual-polarized coupler combines two channels of H-polarized or V-polarized RF signals into one channel and combines the channel of H-polarized RF signals with the channel of V-polarized RF signals.

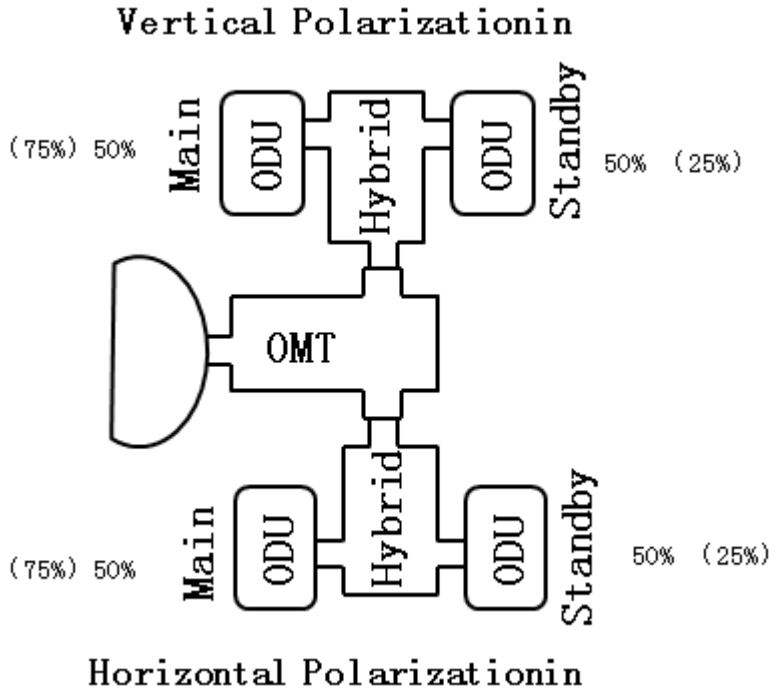
- In the transmit direction, a dual-polarized coupler combines two channels of H-polarized RF signals received from two H-polarized ODUs into one channel and two channels of V-polarized RF signals received from two V-polarized ODUs into one channel, then combines the channel of H-polarized RF signals with the channel of V-polarized RF signals, and finally sends the combined signals to an antenna.
- In the receive direction, a dual-polarized coupler splits the signals received from an antenna into H-polarized RF signals and V-polarized RF signals, splits the H-polarized RF signals into two channels and sends the two channels of signals to two H-polarized ODUs, and splits the V-polarized RF signals into two channels and sends the two channels of signals to two V-polarized ODUs.

7.2 Working Principle

A dual-polarized coupler has five ports and comprises an orthogonal mode transducer (OMT) and two hybrid couplers.

The OMT combines H-polarized and V-polarized waves into dual-polarized waves in transmission direct, and splits dual-polarized waves into H-polarized and V-polarized waves in receive direct, by performing conversion between a rectangular waveguide cavity and a round waveguide cavity. Either hybrid coupler combines/splits H- or V-polarized signals using the coupler in the rectangular waveguide. **Figure 7-1** illustrates the working principle of a dual-polarized coupler.

Figure 7-1 Working principle of a dual-polarized coupler



7.3 Interfaces

The Dual Polarized Coupler has three types of interfaces: antenna interface, V-polarized ODU interface, and H-polarized ODU interface.

- The antenna interface of the Dual Polarized Coupler is a round recessed waveguide interface.
- The ODU interface of the Dual Polarized Coupler is a rectangular protruding waveguide interface.

NOTE

Take waterproof and dustproof measures when the ODU interface is not used.

Figure 7-2 Interfaces of the Dual Polarized Coupler

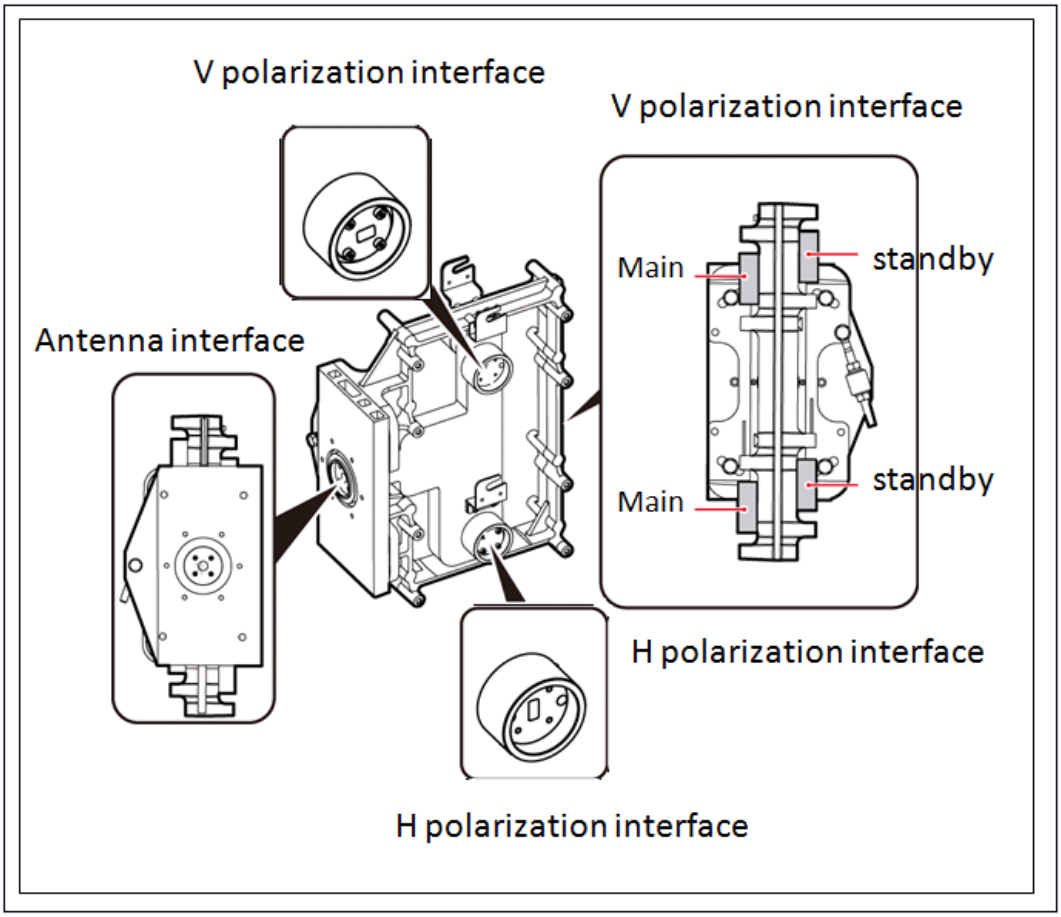


Table 7-1 Description of the interfaces of the Dual Polarized Coupler

Interface	Mark	Function	Type of Connector
Antenna interface	-	Connects to the antenna.	153IEC-R84 (7/8 GHz frequency band) 153IEC-R120 (13 GHz frequency band) 153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18/23/26 GHz frequency band) 153IEC-R320 (28/32/38 GHz frequency band)
Main tributary interface of V-polarized	Main.V	Connects to the main ODU of V-polarized.	
Extension tributary interface of V-polarized	STB.V	Connects to the standby ODU of V-polarized.	
Main tributary interface of H-polarized	Main.H	Connects to the main ODU of H-polarized.	
Extension tributary interface of H-polarized	STB.H	Connects to the standby ODU of H-polarized.	

NOTE

The XMC-3/XMC-3W/XMC-3H ODU antenna port is of I-shaped and therefore can be interconnected to either the horizontal or vertical interface.

7.4 Technical Specifications

The technical specifications of the Dual Polarized Coupler include electrical and mechanical specifications.

Table 7-2 Electrical specifications of the Dual Polarized Coupler

Frequency Band (GHz)	Frequency Range (GHz)	6dB series		3dB series		VSWR	Polarization Isolation(dB)	Coupling Isolation(dB)
		Loss of the main tributary (dB)	Loss of the extension tributary (dB)	Loss of the main tributary (dB)	Loss of the extension tributary (dB)			
7/8	7.125 to 8.5	2.0±0.3	6.8±0.5	3.7±0.5	3.7±0.5	1.3	35	20
13	12.7 to 13.3	2.0±0.3	6.8±0.5	3.7±0.5	3.7±0.5	1.3	35	20
15	14.4 to 15.4	2.2±0.3	6.8±0.5	3.7±0.5	3.7±0.5	1.3	35	20
18	17.7 to 19.7	2.2±0.3	7.0±0.5	3.9±0.5	3.9±0.5	1.3	35	20
23	21.2 to 23.6	2.2±0.3	7.0±0.5	3.9±0.5	3.9±0.5	1.3	35	20
26	24.25 to 26.5	2.2±0.3	7.0±0.5	-	-	1.4	35	20
28	27.5 to 29.5	2.4±0.3	7.7±0.5	–	-	1.4	35	20
38	37.0 to 40.0	2.4±0.3	7.7±0.5	4.2±0.5	4.2±0.5	1.4	35	20

Table 7-3 Mechanical specifications of the Dual Polarized Coupler

Weight (kg)	Dimensions
≤19.2	≤240mm×500mm×410mm (W x D x H)

8 Four-Port Hybrid Coupler

A four-port hybrid coupler helps install four ODUs directly on one coupler and is connected to the antenna using flexible waveguides.

8.1 Functions and Features

A four-port hybrid coupler combines four channels of co-polarized RF signals into one channel.

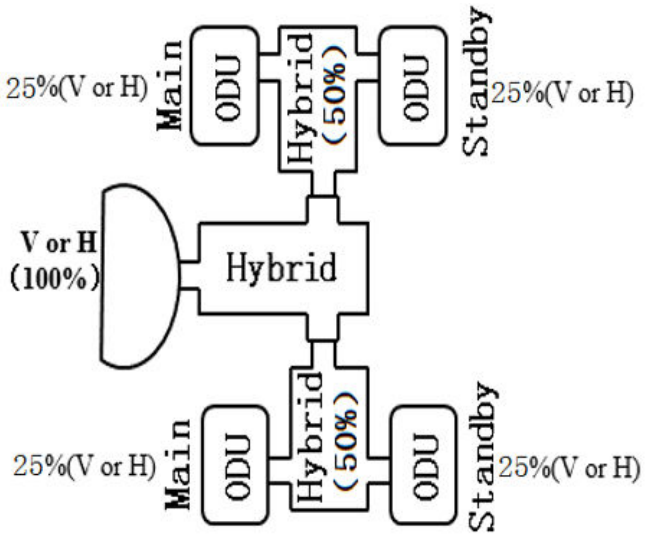
- In the transmit direction, a four-port hybrid coupler combines four channels of co-polarized RF signals into one channel. It is interconnected with antennas using flexible waveguides, and then sends the combined signals to the antennas.
- In the receive direction, a four-port hybrid coupler separates RF signals received from the antennas into four channels of co-polarized RF signals.

8.2 Working Principles

A four-port hybrid coupler is a microwave component having five interfaces. Such a coupler consists of three 3 dB couplers.

Figure 8-1 illustrates the working principles of a four-port hybrid coupler.

Figure 8-1 Working principles of a four-port hybrid coupler



8.3 Interfaces

A four-port hybrid coupler has one antenna interface and four co-polarized ODU interfaces.

- Four-port hybrid couplers use UBR interfaces on flanges as interfaces connecting antennas and are interconnected with antennas using soft waveguides.
- Four-port hybrid couplers use depression rectangular waveguide interfaces.

WARNING

Protect the interfaces from water and dusts before you use the couplers for the first time.

Figure 8-2 Interfaces of a four-port hybrid coupler

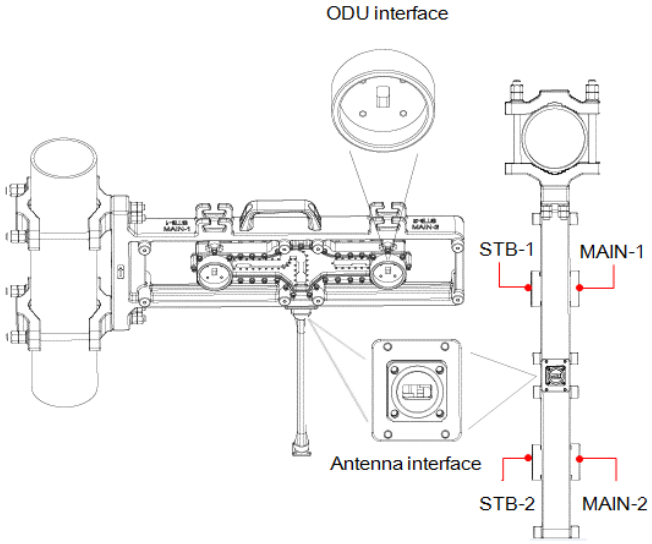


Table 8-1 Descriptions about interfaces of four-port hybrid couplers

Interface	Mark	Function	Type of Connector
Antenna interface	-	Connects to antennas using flexible waveguides.	153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18, 23, or 26 GHz frequency band) 153IEC-R320 (28, 32, or 38 GHz frequency band)
Main tributary interface 1	Main-1	Connects to the main tributary ODU.	
Extension tributary interface 1	STB-1	Connects to the standby ODU.	
Main tributary interface 2	Main-2	Connects to the main tributary ODU.	
Extension tributary interface 2	STB-2	Connects to the standby ODU.	

NOTE

XMC-3/XMC-3W/XMC-3H ODU antenna interfaces are I-shaped and do not distinguish horizontal and vertical polarization.

8.4 Technical Specifications

The technical specifications of a four-port hybrid coupler include electrical and mechanical specifications.

Table 8-2 Electrical specifications of the 3 dB four-port hybrid coupler

Model	Frequency Range (GHz)	Main Tributary Attenuation (dB)	Main Tributary Attenuation Fluctuation	Extension Tributary Attenuation (dB)	Extension Tributary Attenuation Fluctuation	Coupling Isolation (dB)	VSWR
C15BRRCQ	14.4 to 15.4	≤7.6	≤1.0	≤7.6	≤1.0	≥20	≤1.3
C18BRRCQ	17.7 to 19.7	≤7.6	≤1.0	≤7.6	≤1.0	≥20	≤1.3
C23BRRCQ	21.2 to 23.6	≤7.6	≤1.0	≤7.6	≤1.0	≥20	≤1.3

Model	Frequency Range (GHz)	Main Tributary Attenuation (dB)	Main Tributary Attenuation Fluctuation	Extension Tributary Attenuation (dB)	Extension Tributary Attenuation Fluctuation	Coupling Isolation (dB)	VSWR
C26BRRCQ	24.2 to 26.5	≤8.2	≤1.0	≤8.2	≤1.0	≥20	≤1.4
C28BRRCQ	27.5 to 29.5	≤8.2	≤1.0	≤8.2	≤1.0	≥20	≤1.4
C32BRRCQ	31.8 to 33.4	≤8.2	≤1.0	≤8.2	≤1.0	≥20	≤1.4
C38BRRCQ	37.0 to 40.0	≤8.2	≤1.0	≤8.2	≤1.0	≥20	≤1.4

Table 8-3 Mechanical specifications of the four-port hybrid coupler

Weight (kg)	Dimensions
≤ 10	650 mm × 170 mm × 260 mm (W x D x H)

9 Separate Mounting Components

The separate mounting components consist of the ODU separate mounting bracket and flexible waveguide. The separate mounting components described in this document are the separate mounting components adaptive to the RTN XMC ODUs.

9.1 ODU Separate Mounting Bracket
When the ODU or hybrid coupler is installed with the antenna separately, the ODU separate mounting bracket can be used to fix the ODU or hybrid coupler on the pole.

9.2 Flange adapter (XMC-5D ODU)
The antenna interface of the XMC-5D ODU is a concave interface. It is connected to the flexible waveguide through the flange adapter to implement split mounting.

9.3 Flexible Waveguide
A flexible waveguide is rectangular. It is used to connect the flange interface of the ODU or hybrid coupler with the flange interface of the antenna.

9.1 ODU Separate Mounting Bracket

When the ODU or hybrid coupler is installed with the antenna separately, the ODU separate mounting bracket can be used to fix the ODU or hybrid coupler on the pole.

Appearance

The separated mounting bracket, as shown in **Figure 9-1**, can be used for XMC-2, XMC-2H, XMC-3, XMC-3W, or XMC-3H ODU.

The separated mounting bracket, as shown in **Figure 9-1**, can be used for XMC-5D ODU, or dual coupler.

Figure 9-1 Exterior of the separated mounting bracket of the single-channel ODU

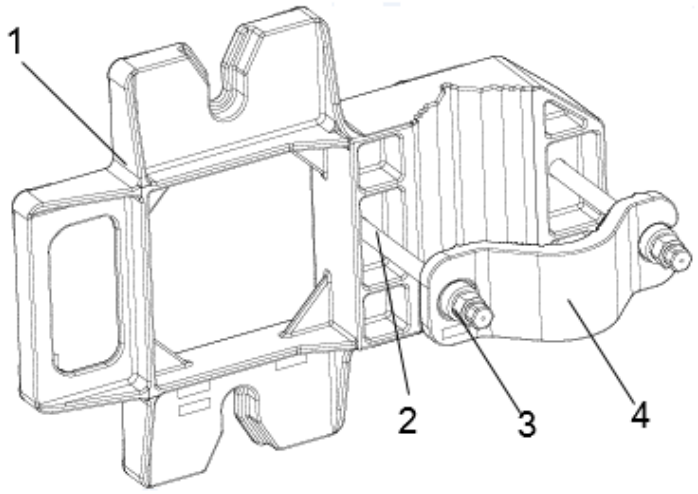
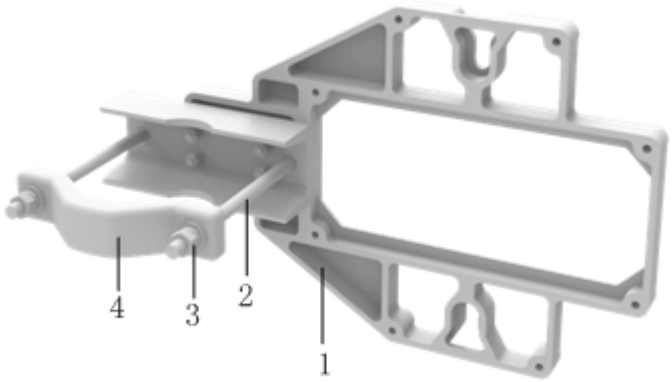


Figure 9-2 Exterior of the separated mounting bracket of the dual-channel ODU



1.Main bracket 2. Long bolt 3. Dual-port nut 4. Auxiliary bracket

The ODU separate mounting bracket can be used to secure an ODU to a pole with a diameter of 51 mm to 114 mm.

The main bracket is used together with the auxiliary bracket, long bolt, and nut to fix the whole bracket on the pole. The ODU and hybrid coupler can be installed on the main bracket.

9.2 Flange adapter (XMC-5D ODU)

The antenna interface of the XMC-5D ODU is a concave interface. It is connected to the flexible waveguide through the flange adapter to implement split mounting.

The flange adapter is applicable to the split mounting scenarios of the XMC-5D ODU or double coupler.

Figure 9-3 Appearance of the flange adapter

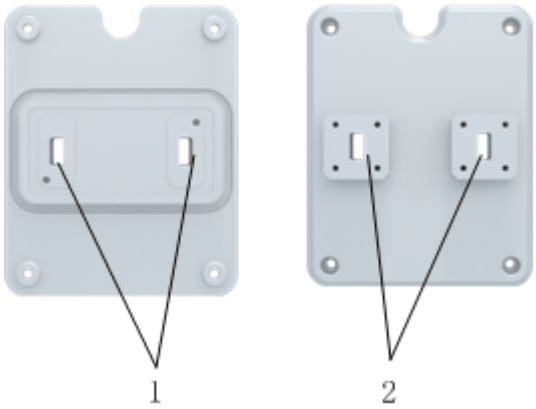


Table 9-1 Interfaces on the flange adapter

No.	Interface Name	Purpose	Interface Type
1	ODU interface	Connects to an XMC-5D ODU or a double coupler.	Can be interconnected with the XMC-5D ODU (13 GHz/15 GHz frequency band) Can be interconnected with the XMC-5D ODU (18 GHz frequency band)
2	Flexible waveguide interface	Connects to a flexible waveguide.	Can be interconnected with the PBR120 (13 GHz frequency band) Can be interconnected with the PBR140 (15 GHz frequency band) Can be interconnected with the PBR220 (18 GHz frequency band)

The flange adapter is directly connected to the ODU through four screws at four corners. The flexible waveguide is connected to the flange adapter through the flexible waveguide interface.

Table 9-2 Electrical specifications of the flange adapter

Frequency Band (GHz)	Frequency Range (GHz)	Maximum Loss (dB)
13	12.75 to 13.25	0.1
15	14.4 to 15.35	0.1
18	17.7 to 19.7	0.1

9.3 Flexible Waveguide

A flexible waveguide is rectangular. It is used to connect the flange interface of the ODU or hybrid coupler with the flange interface of the antenna.

Appearance

Figure 9-4 shows the appearance of the flexible waveguide.

Figure 9-4 Appearance of the flexible waveguide

Technical Specifications

Table 9-3 lists the technical specifications of the flexible waveguide.

Table 9-3 Technical specifications of the flexible waveguide

Frequency Band	Length(m)	Maximum Attenuation(dB)	Maximum twist degree (°)	Minimum E-bend radius(mm)	Minimum H-bend radius(mm)	Minimum Voltage Standing Wave Ratio	Interface(Antenna side)	Interface(ODU/ hybrid coupler side)
6 GHz	0.9, 1.2, 1.8	0.2, 0.3, 0.4	195	102	204	1.1	PDR70	PDR70
7, 8 GHz	0.9, 1.2, 1.8	0.3, 0.4, 0.6	240	76	152	1.1	PBR84	PBR84
10 GHz	0.6, 0.9, 1.2, 1.8	0.24, 0.4, 0.5, 0.8	280	64	127	1.1	PBR100	PBR100

Frequency Band	Length(m)	Maximum Attenuation(dB)	Maximum twist degree (°)	Minimum E-bend radius(mm)	Minimum H-bend radius(mm)	Minimum Voltage Standing Wave Ratio	Interface(Antenna side)	Interface(ODU/ hybrid coupler side)
11 GHz	0.6, 0.9, 1.2, 1.8	0.24, 0.4, 0.5, 0.8	280	64	127	1.1	PBR100	PBR100
13 GHz	0.6, 0.9, 1.2, 1.8	0.3, 0.5, 0.6, 0.9	330	64	115	1.1	PBR120	PBR120
15 GHz	0.6, 0.9	0.4, 0.8	405	52	102	1.1	PBR140	PBR140
18, 23, 26 GHz	0.6, 0.9	0.75, 1.2	465	38	76	1.2	PBR220	PBR220
28, 32, 38 GHz	0.6, 0.9	1.2, 1.8	465	38	76	1.2	PBR320	PBR320
42 GHz	0.9	2.4	530	26	52	1.4	UG383, U-R400	UG383, U-R400

10 Antennas

The microwave device uses the parabolic antennas to transmit and receive electromagnetic waves. The antennas described in this document are the parabolic antennas adaptive to the RTN XMC ODUs.

10.1 Device Type

Antennas are classified into two types, namely, the single-polarized antenna and dual-polarized antenna.

In addition to simple single-polarization and dual-polarization antennas, there are some special antennas:

The UHP S2D antenna is a multifunctional antenna that converts the default single polarized antenna into a bipolar antenna by modification.

The UHP SDB antenna is a dual-frequency antenna that transmits both traditional band and E-band signals at the same time. Each frequency band can be single-polarization or dual-polarization.

The UHP modular antenna is a new type of combinatorial antenna. It can be switched from traditional band to E-band or from a traditional frequency to another by replacing the feed. The antenna can be switched between single-polarized antenna and dual-polarized antenna by replacing parts.

10.1.1 Single-polarized antenna

The single-polarized antenna transmits or receives electromagnetic waves in a specific polarization direction. The single-polarized antenna provides a feed boom interface. The feed boom interface can be set to be vertically polarized or horizontally polarized.

According to the mode of installing the ODU on the antenna, the single-polarized antenna is classified into two types, namely, the direct mounting mode and separate mounting mode. The single-polarized antenna with the diameter less than or equal to 1.8 m supports the direct mounting mode and separate mounting mode. The single-polarized antenna with the diameter greater than 1.8 m supports the separate mounting mode.

Figure 10-1 and **Figure 10-2** show the feed booms of the single-polarized antennas.

Figure 10-1 Feed boom of the single-polarized antenna with the diameter less than or equal to 1.8 m

Figure 10-2 Feed boom of the single-polarized antenna with the diameter greater than 1.8 m

10.1.2 Dual-polarized antenna

The dual-polarized antenna transmits and receives horizontally-polarized and vertically-polarized electromagnetic waves at the same time. According to the mode of installing the ODU to the antenna, the dual-polarized antenna is classified into two types, namely, direct-mount antenna and separate-mount antenna.

Figure 10-3 and **Figure 10-4** show the feed booms of the separate-mount dual-polarized antenna and the direct-mount dual-polarized antenna.

Figure 10-3 Feed boom of the separate-mount dual-polarized antenna

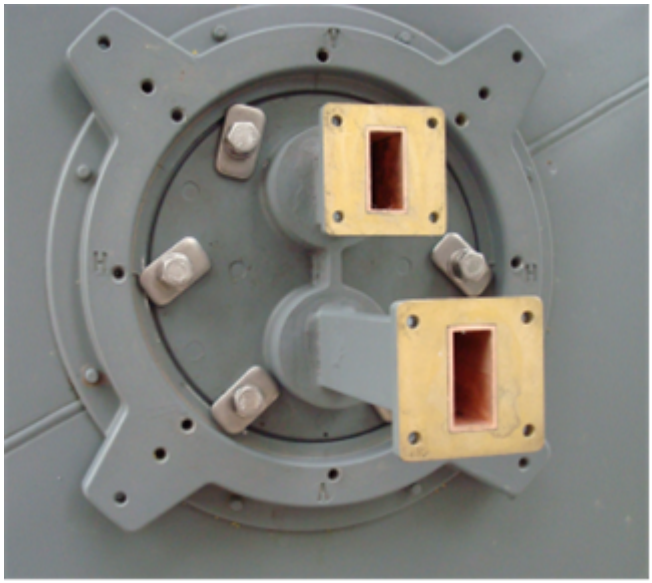
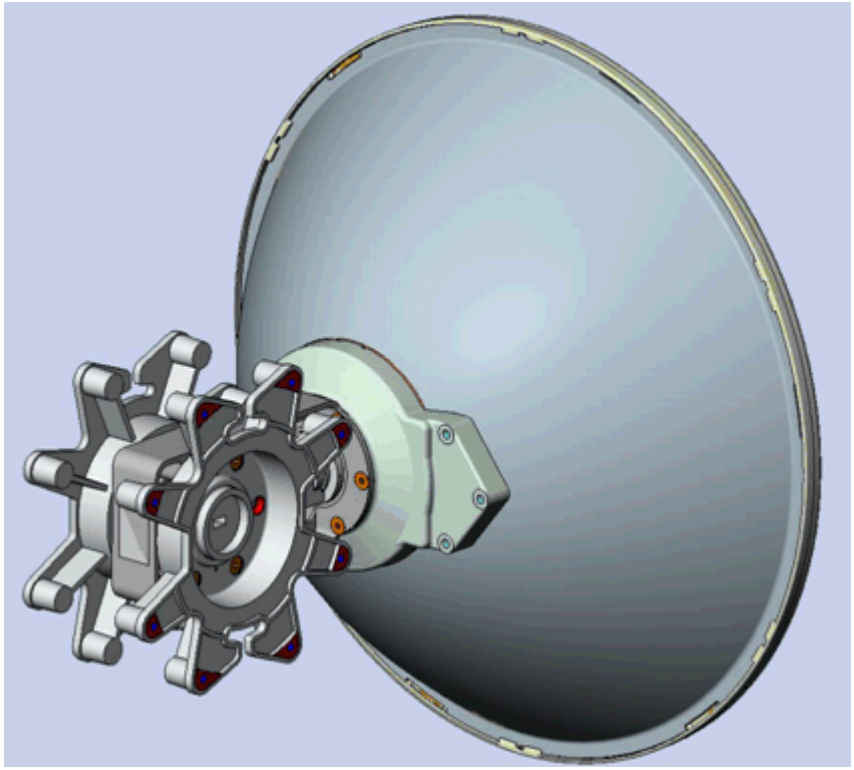


Figure 10-4 Feed boom of the direct-mount dual-polarized antenna



10.1.3 UHP S2D antenna

The UHP S2D antenna is a multi-function antenna. It has the following functions:

- A single-polarized antenna is used by default, which can be transformed to a dual-polarized antenna installed in direct-mounting mode.
- If a single-polarized antenna is transformed to a dual-polarized antenna, the OMT or dual-polarized combiner can be used to allow multiple ODUs to be installed in direct-mounting mode. In this way, the configuration of **XPIC/1+1** or ACAP/CCDP 4+0 can be achieved.

10.1.4 UHP SDB antenna

UHP SDB antennas are dual-band antennas. One antenna can transmit both common-frequency-band and E-band signals. These antennas have the following functions:

- This type of microwave antennas provides both horizontal and vertical polarization. The antennas are vertically polarized by default in factory settings. Customers can change the polarization state as required.
- The antennas support both single polarization and dual polarization on common frequency bands, and support both single polarization and dual polarization on the Eband.
- Suggestions on antenna alignment: Align antennas for common frequency bands, and then for the E-band.

There are two kinds of UHP SDB antennas. **Figure 10-5** and **Figure 10-6** show the appearance of antennas.

ODU Type	Polarization	Figure 10-5	Figure 10-6
XMC-2/XMC-3/ XMC-3W/ XMC-3H ODU	Single-polarization	Supported	Supported
	Dual-polarization	Not supported	Supported
XMC-5D ODU	Single-polarization	Supported	Not supported
	Dual-polarization	Supported	Not supported

Figure 10-5 Appearance of antennas (1)

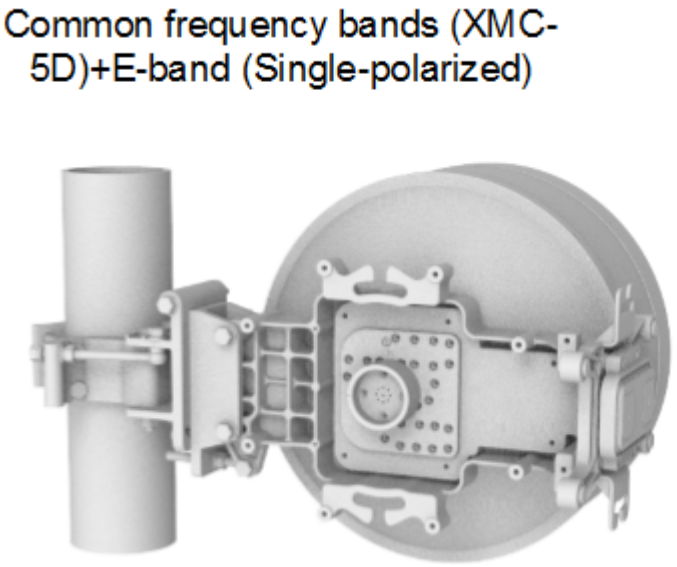
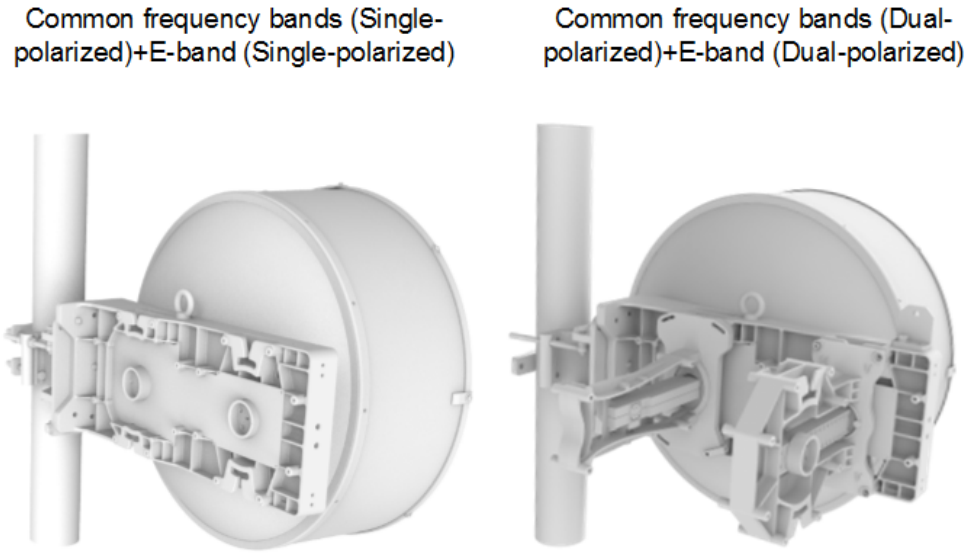


Figure 10-6 Appearance of antennas (2)

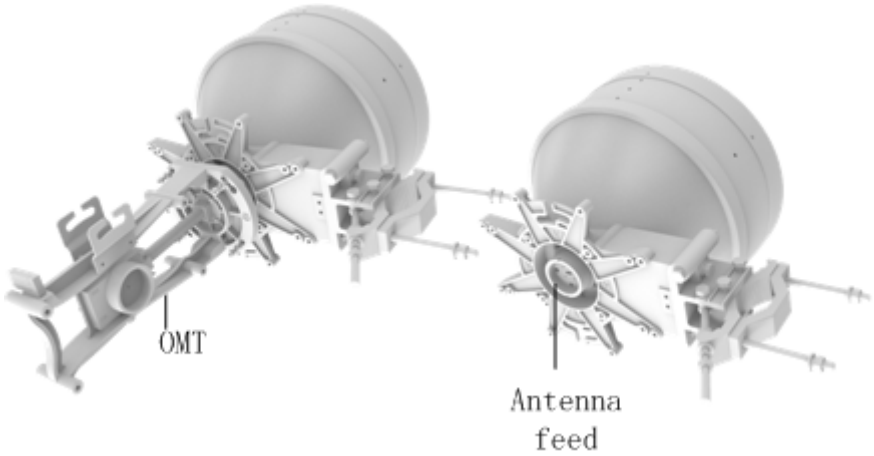


10.1.5 UHP Modular Antenna

The UHP modular antenna is a new-generation combination antenna. The components of this antenna can be split. The functions are as follows:

- This antenna provides two types of antennas: Class 3 and Class 4.
- With the addition of an OMT, single-polarized antennas can be changed to dual-polarized antennas.
- With the replacement of an antenna feed, the antenna may be used in different frequency bands, including the common frequency band (6 GHz ~ 42 GHz) and the E-band frequency band (71 GHz ~ 76 GHz or 81 GHz ~ 86 GHz).

Figure 10-7 Appearance of the UHP modular antenna



10.2 Functions

The microwave antenna is used to convert between the RF signals transmitted from the ODU and electromagnetic waves radiated in the air.

- In the TX direction, the antenna converts the RF signals transmitted from the ODU into directional electromagnetic waves and then radiates electromagnetic waves in the air.
- In the RX direction, the antenna receives and assembles electromagnetic waves from the air, converts electromagnetic waves into the RF signals, and then transmits the RF signals to the ODU.

10.3 Working Principles

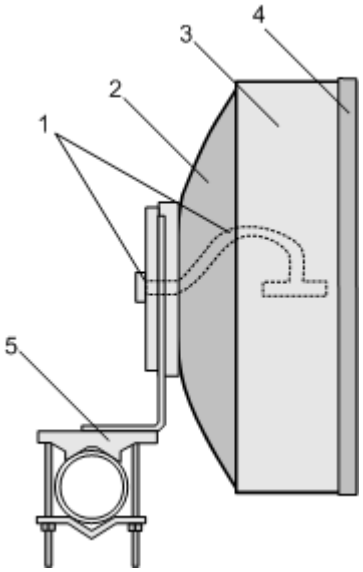
The antenna consists of the reflector, feed boom, radome, shield, and mounting bracket.

Figure 10-8 shows the structure of the antenna.

NOTE

This section takes the single-polarized antenna as an example to describe the working principles of antennas. The dual-polarized antenna has two feed boom interfaces and thus can transmit and receive electromagnetic waves in the vertical and horizontal polarization directions at the same time. The working principles of each component of the dual-polarized antenna are similar to the working principles of each component of the single-polarized antenna.

Figure 10-8 Structure of the antenna



1. Feed boom	2. Reflector	3. Shield
4. Radome	5. Mounting bracket	-

The functions of each component of the antenna are described as follows:

- Feed boom

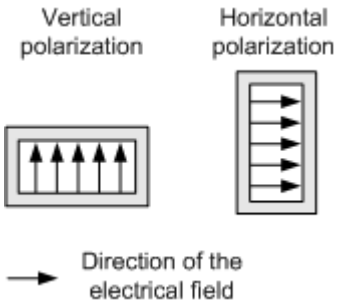
  The input interface of the feed boom receives the RF signals transmitted from the ODU. The received RF signals are transmitted through the waveguide to the output interface of the feed boom, which is located at the focal spot of the reflector. The output interface of the feed boom is equivalent to a preliminary horn antenna. It radiates electromagnetic waves towards the antenna reflector.

You can change the polarization direction of the antenna by rotating the feed boom. The polarization direction of the antenna is the polarization of electromagnetic waves radiated by the antenna. The polarization direction of electromagnetic waves is the direction of the electrical field. **Figure 10-9** shows the polarization directions supported by the rectangular waveguide.

NOTE

The polarization direction of the antenna must be the same as the polarization direction of the ODU or hybrid coupler. The feed booms of certain types use the round waveguide. In this case, see installation instructions of the antenna to adjust the polarization direction of the antenna according to the polarization identifier.

Figure 10-9 Polarization directions supported by the rectangular waveguide



- Reflector

  Normally, the reflector of the microwave antenna is a rotatable paraboloid. The reflector is mainly used for reflecting electromagnetic waves and providing the directive gain.
  - In the TX direction, the reflector reflects electromagnetic waves radiated from the feed boom so that electromagnetic waves are directional.
  - In the RX direction, the reflector reflects electromagnetic waves received from a wider space, and then assembles electromagnetic waves to the output interface of the feed boom.
- Radome

  The radome protects the antenna from damages caused by the wind, rain, and ice. Electromagnetic waves can be radiated through the radome.
- Shield

  The shield is installed on the HP antenna. The shield is mainly used for suppressing the radiation of the side lobes.
- Mounting bracket

  The mounting bracket is used for fixing the antenna onto the pole and for adjusting the azimuth and elevation slightly. In addition to the mounting bracket, a reinforcing rod is required for fixing the antenna with a larger diameter. For details, see the instructions for the antenna.

10.4 Interfaces

The feed boom interface of the single-polarized antenna in direct mounting mode is a waveguide interface. The feed boom interfaces of the single-polarized antenna in separate mounting mode and of the dual-polarized antenna are flange interfaces.

Table 10-1 lists the specifications for the feed boom interface of the antenna adaptive to the XMC ODU.

Table 10-1 Specifications for the feed boom interface of an antenna

Frequency Band	Interface Type			
	Direct-Mount Single-Polarized Antenna	Direct-Mount Dual-Polarized Antenna	Separate-mount Single-Polarized Antenna	Separate-mount Dual-Polarized Antenna
6 GHz	153IEC-R70, can be interconnected with the PDR70	153IEC-R70	154IEC-PDR70	154IEC-PDR70
7/8 GHz	153IEC-R84, can be interconnected with the PBR84	153IEC-R84	154IEC-UBR84	154IEC-UBR84
10/11 GHz	153IEC-R100, can be interconnected with the PBR100	153IEC-R100	154IEC-UBR100	154IEC-UBR100
13 GHz	153IEC-R120, can be interconnected with the PBR120	153IEC-R120	154IEC-UBR120	154IEC-UBR120
15 GHz	153IEC-R140, can be interconnected with the PBR140	153IEC-R140	NA	154IEC-UBR140
18/23/26 GHz	153IEC-R220, can be interconnected with the PBR220	153IEC-R220	NA	154IEC-UBR220
28/32/38 GHz	154IEC-R320, can be interconnected with the PBR320	153IEC-R320	NA	154IEC-UBR320
42 GHz	UG 383/U-R400, can be interconnected with the UG 383/U-R400	UG383	NA	UG383

10.5 Antenna Diameters

The antenna diameters vary according to the antenna type and the frequency band where the antenna operates.

Table 10-2 and Table 10-3 list the diameters supported by different types of antennas. "Y" indicates that the corresponding antenna diameter is supported. "NA" indicates that the corresponding antenna diameter is not supported.

Table 10-2 Diameter of the single-polarized antenna

Frequency Band	Antenna Diameter									
	0.2 m	0.3 m	0.6 m	0.9 m	1.0 m	1.2 m	1.8 m	2.4 m	3.0 m	3.7 m
6 GHz	NA	NA	NA	Y	Y	Y	Y	Y	Y	Y
7/8 GHz	NA	NA	Y	Y	Y	Y	Y	Y	Y	Y
10GHz	NA	Y	Y	Y	Y	Y	Y	NA	NA	NA
11GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA
13 GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA
15 GHz	NA	Y	Y	Y	Y	Y	Y	NA	NA	NA
18 GHz	NA	Y	Y	Y	Y	Y	Y	NA	NA	NA
23 GHz	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA
26 GHz	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA
28 GHz	NA	Y	Y	NA	NA	NA	NA	NA	NA	NA
32 GHz	NA	Y	Y	NA	NA	NA	NA	NA	NA	NA
38 GHz	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA
42 GHz	NA	Y	Y	NA	NA	NA	NA	NA	NA	NA

Table 10-3 Diameter of the separate-mount dual-polarized antenna

Frequency Band	Antenna Diameter								
	0.3 m	0.6 m	0.9 m	1.0 m	1.2 m	1.8 m	2.4 m	3.0 m	3.7 m
6 GHz	NA	NA	NA	Y	Y	Y	Y	Y	Y
7/8 GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y
10 GHz	NA	Y	Y	Y	Y	Y	NA	NA	NA
11 GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y
13 GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y
15 GHz	NA	Y	Y	Y	Y	Y	NA	NA	NA
18 GHz	NA	Y	Y	Y	Y	Y	NA	NA	NA
23 GHz	NA	Y	Y	Y	Y	Y	NA	NA	NA
26 GHz	Y	Y	Y	Y	Y	NA	NA	NA	NA
28 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA

Frequency Band	Antenna Diameter								
	0.3 m	0.6 m	0.9 m	1.0 m	1.2 m	1.8 m	2.4 m	3.0 m	3.7 m
32 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA
38 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA
42 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA

Table 10-4 Diameter of the direct-mount dual-polarized antenna

Frequency Band	Antenna Diameter					
	0.3 m	0.6 m	0.9 m	1 m	1.2 m	1.8 m
6 GHz	NA	NA	NA	NA	NA	NA
7/8 GHz	NA	Y	Y	Y	Y	Y
10 GHz	NA	Y	Y	Y	Y	Y
11 GHz	NA	Y	Y	Y	Y	Y
13 GHz	Y	Y	Y	Y	Y	Y
15 GHz	Y	Y	Y	Y	Y	Y
18 GHz	Y	Y	Y	Y	Y	Y
23 GHz	Y	Y	Y	Y	Y	Y
26 GHz	Y	Y	Y	Y	Y	NA
28 GHz	Y	Y	NA	NA	NA	NA
32 GHz	Y	Y	NA	NA	NA	NA
38 GHz	Y	Y	NA	NA	NA	NA
42 GHz	NA	NA	NA	NA	NA	NA

Table 10-5 Diameter of the UHP S2D antenna

Frequency Band	Antenna Diameter			
	0.3 m	0.6 m	1.2 m	1.8 m
7/8 GHz	NA	Y	Y	Y
10/11 GHz	NA	Y	Y	Y
11 GHz	Y	Y	Y	Y
13 GHz	Y	Y	Y	Y

Frequency Band	Antenna Diameter			
	0.3 m	0.6 m	1.2 m	1.8 m
15 GHz	Y	Y	Y	Y
18 GHz	Y	Y	Y	Y
23 GHz	Y	Y	Y	Y
26 GHz	Y	Y	Y	NA
28 GHz	Y	Y	NA	NA
32 GHz	Y	Y	NA	NA
38 GHz	Y	Y	NA	NA

Table 10-6 Diameter of the UHP SDB antenna

Frequency Band	ODU	Antenna Diameter	
		0.3 m	0.6 m*
15&80 GHz	XMC-2/ XMC-3/ XMC-3W/ XMC-3H	NA	Y
	XMC-5D	NA	Y
18&80 GHz	XMC-2/ XMC-3/ XMC-3W/ XMC-3H	Y	Y
	XMC-5D	NA	Y
23&80 GHz	XMC-2/ XMC-3/ XMC-3W/ XMC-3H	Y	Y
	XMC-5D	NA	NA
38&80 GHz	XMC-2/ XMC-3/ XMC-3W/ XMC-3H	Y	NA
	XMC-5D	NA	NA

NOTE

*: The common-band and E-band of the UHP SDB antenna with the 0.6m diameter support both single-polarized installation and dual-polarized installation. But when common band used XMC-5D ODU whose appearence just like **Figure 10-5**, the E-band only support single-polarized installation.

Table 10-7 Diameter of the UHP Modular antenna (Class 3, single-polarized, direct-mount/separate-mount compatibility)

Frequency Band	Antenna Diameter			
	0.3 m	0.6 m	0.9 m	1.2 m
L6&U6 GHz	NA	NA	Y	Y
7&8 GHz	NA	Y	Y	Y
10&11 GHz	Y	Y	Y	Y
13 GHz	Y	Y	Y	Y
15 GHz	Y	Y	Y	Y
18 GHz	Y	Y	Y	Y
23 GHz	Y	Y	Y	Y
26 GHz	Y	Y	Y	Y
28 GHz	Y	Y	NA	NA
32 GHz	Y	Y	NA	NA
38 GHz	Y	Y	NA	NA
42 GHz	Y	Y	NA	NA
80 GHz	Y	Y	NA	NA

Table 10-8 Diameter of the UHP Modular antenna (Class 3, dual-polarized, direct-mount, only working with XMC-5D ODU)

Frequency Band	Antenna Diameter			
	0.3 m	0.6 m	0.9 m	1.2 m
13 GHz	Y	Y	Y	Y
15 GHz	Y	Y	Y	Y
13&15 GHz	NA	Y	NA	NA
18 GHz	Y	Y	Y	Y

Table 10-9 Diameter of the UHP Modular antenna (Class 3, dual-polarized, direct-mount/ separate-mount compatibility)

Frequency Band	Antenna Diameter			
	0.3 m	0.6 m	0.9 m	1.2 m
7&8 GHz	NA	Y	Y	Y
10&11 GHz	NA	Y	Y	Y
13 GHz	Y	Y	Y	Y
15 GHz	Y	Y	Y	Y
18 GHz	Y	Y	Y	Y
23 GHz	Y	Y	Y	Y
26 GHz	Y	Y	Y	Y
28 GHz	Y	Y	NA	NA
32 GHz	Y	Y	NA	NA
38 GHz	Y	Y	NA	NA
80 GHz	Y	Y	NA	NA

Table 10-10 Diameter of the UHP Modular antenna (Class 3, dual-polarized, separate-mount)

Frequency Band	Antenna Diameter			
	0.3 m	0.6 m	0.9 m	1.2 m
L6&U6GHz	NA	NA	NA	Y
7&8 GHz	NA	Y	Y	Y
10&11 GHz	NA	Y	Y	Y
13 GHz	NA	Y	Y	Y
15 GHz	NA	Y	Y	Y
18 GHz	NA	Y	Y	Y
23 GHz	NA	Y	Y	Y
26 GHz	Y	Y	Y	Y
28 GHz	Y	Y	NA	NA
32 GHz	Y	Y	NA	NA
38 GHz	Y	Y	NA	NA
42 GHz	Y	Y	NA	NA

Table 10-11 Diameter of the UHP Modular antenna (Class 4, single-polarized, direct-mount/separate-mount compatibility)

Frequency Band	Antenna Diameter		
	0.3 m	0.6 m	0.9 m
10&11 GHz	NA	NA	Y
13 GHz	NA	NA	Y
15 GHz	NA	Y	Y
18 GHz	NA	Y	Y
23 GHz	Y	Y	Y
26 GHz	Y	Y	Y
28 GHz	Y	Y	NA
32 GHz	Y	Y	NA
38 GHz	Y	Y	NA
42 GHz	Y	Y	NA

Table 10-12 Diameter of the UHP Modular antenna (Class 4, dual-polarized, direct-mount, only working with XMC-5D ODU)

Frequency Band	Antenna Diameter	
	0.6 m	0.9 m
13 GHz	NA	Y
15 GHz	Y	Y
18 GHz	Y	Y

Table 10-13 Diameter of the UHP Modular antenna (Class 4, dual-polarized, direct-mount/separate-mount compatibility)

Frequency Band	Antenna Diameter		
	0.3 m	0.6 m	0.9 m
10&11 GHz	NA	NA	Y
13 GHz	NA	NA	Y
15 GHz	NA	Y	Y
18 GHz	NA	Y	Y

Frequency Band	Antenna Diameter		
	0.3 m	0.6 m	0.9 m
23 GHz	Y	Y	Y
26 GHz	Y	Y	Y
28 GHz	Y	Y	NA
32 GHz	Y	Y	NA
38 GHz	Y	Y	NA

Table 10-14 Diameter of the UHP Modular antenna (Class 4, dual-polarized, separate-mount)

Frequency Band	Antenna Diameter		
	0.3 m	0.6 m	0.9 m
10&11 GHz	NA	NA	Y
13 GHz	NA	NA	Y
15 GHz	NA	Y	Y
18 GHz	NA	Y	Y
23 GHz	NA	Y	Y
26 GHz	Y	Y	Y
28 GHz	Y	Y	NA
32 GHz	Y	Y	NA
38 GHz	Y	Y	NA
42 GHz	Y	Y	NA

10.6 Technical Specifications

The technical specifications of the antenna include the electrical indexes and mechanical indexes. The electrical indexes of the antenna include the antenna gain, half-power beamwidth, VSWR, and front-to-back ratio. The mechanical indexes of the antenna include the size, weight, wind-protective feature, and ice/snow-protective feature.

Huawei provides a complete antenna series. For details about antenna specifications, contact Huawei engineers to obtain corresponding antenna specifications documents according to the *RTN Microwave Antenna Specifications Index*.

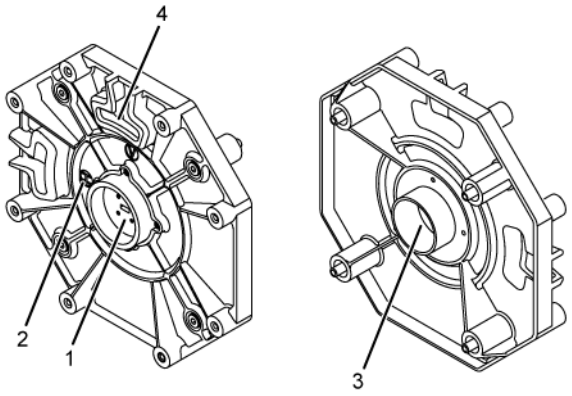
11 Antenna Adapter

This describes the antenna adapter. In direct mounting mode, the antenna adapter is used for transfer if the antenna does not adaptive to the RTN XMC ODU.

Appearance and Interfaces

Figure 11-1 shows the appearance and interfaces of the antenna adapter.

Figure 11-1 Appearance and interfaces of the antenna adapter



1. Interface on the ODU/ hybrid coupler side
2. Polarization identifier
3. Interface on the antenna side
4. Guide trough

Technical Specifications

Table 11-1 lists the technical specifications of the antenna adapter.

Table 11-1 Technical specifications of the antenna adapter

Item	Specification
Loss	≤ 0.2 dB (7/8/10/11/13/15/18/23/26/28/32/38 GHz frequency band)

Item		Specification
Voltage Standing Wave Ratio (VSWR)		≤ 1.3 (7/8/10/11/13/15/18/23/26/28/32/38 GHz frequency band)
Interfaces	Antenna side	1.025 inch dia circular (7/8 GHz frequency band) 153IEC-R100 (10/11 GHz frequency band) 153IEC-R120 (13 GHz frequency band) 153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18/23/26 GHz frequency band) 153IEC-R320 (28/32 GHz frequency band) 0.219 inch dia Circular (38 GHz frequency band)
	ODU/hybrid coupler side	153IEC-R84, can be interconnected with the PBR84 (7/8 GHz frequency band) 153IEC-R100, can be interconnected with the PBR100 (10/11 GHz frequency band) 153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band) 153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18/23/26 GHz frequency band) 153IEC-R320, can be interconnected with the PBR320 (28/32/38 GHz frequency band)
Weight		≤ 2.5 kg

Labels

The following labels are attached to the antenna adapter: nameplate label, and bar code. These labels are used to identify the basic information of the antenna adapter.

- Nameplate Label

  Figure 11-2 shows the nameplate label of the antenna adapter.

  Figure 11-2 Nameplate label of the antenna adapter

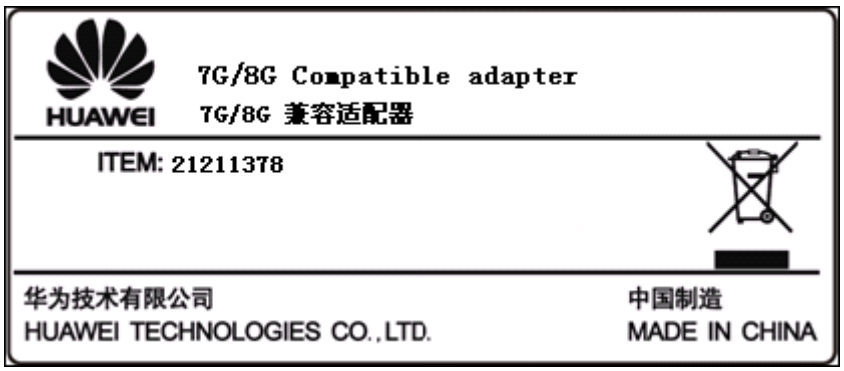


Table 11-2 describes the meanings of the parameters on the nameplate label.

Table 11-2 Meanings of the parameters on the nameplate label

Label Information	Content of the Label	Parameter	Meaning
Antenna adapter name	7G/8G Compatible adapter ① ②	①: Frequency band	Working frequency of the antenna adapter: 7/8/10/11/13/15/18/23/26/32/38 (GHz)
		②: Component name	Indicates that the component is an antenna adapter
Antenna adapter code (ITEM)	21211378	-	Used to identify the type of the antenna adapter

- Bar Code

  Table 11-3 shows the bar code of the antenna adapter and describes the meanings of the label.

Table 11-3 Bar code

Name	Appearance	Meaning
Bar code		Bar code of the antenna adapter serial number, which is used to uniquely identify each antenna adapter

12 Cables

This describes the cables of the ODU. The cables of the ODU which consist of the IF cable and ODU PGND cable.

12.1 IF Cable
The IF cable is used to connect the ODU with the IDU and transmits the IF signals O&M signals and -48 V power between the ODU and the IDU.

12.2 PGND Cable of the ODU
The ODU PGND cable is used to connect the grounding screw of the ODU to the outdoor ground point such as the ground point on the tower so that the ODU can be connected to the outdoor grounding grid.

12.1 IF Cable

The IF cable is used to connect the ODU with the IDU and transmits the IF signals O&M signals and -48 V power between the ODU and the IDU.

The IF cable can be categorized into three types: 5D cable, RG-8U cable, and 1/2-inch cable.

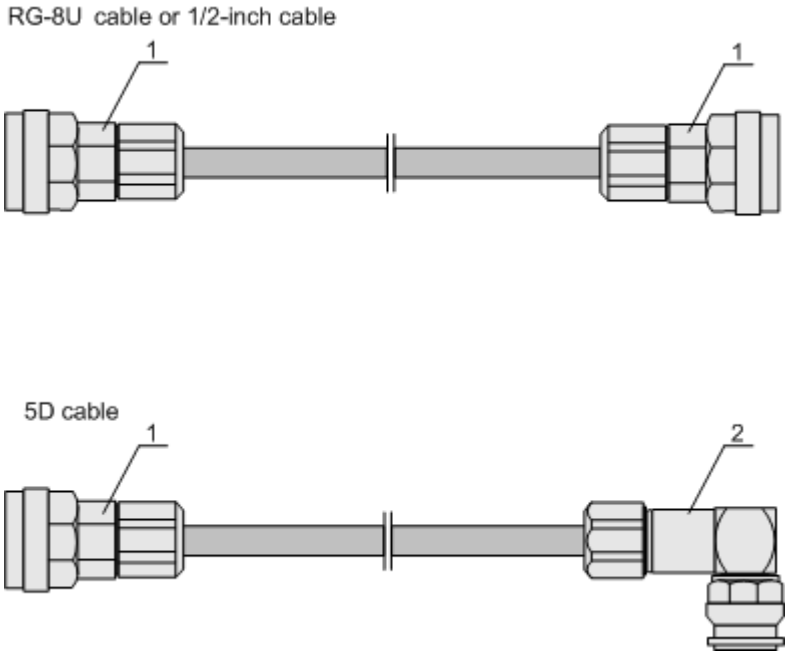
- If the distance between the IDU and the ODU is shorter than 120 m, the 5D cable is used. The 5D cable has an N-type connector at one end connected to the IF interface of the ODU and a TNC connector at the other end connected to the IF interface of the IDU.
- If the distance between the IDU and the ODU is from 120 m to 180 m, the RG-8U cable is used. The RG-8U cable has an N-type connector at each end. One end is connected to the IF interface of the ODU and the other end is connected with the IF jumper of the IDU.
- If the distance between the IDU and the ODU is from 180 m to 300 m, the 1/2-inch cable is used. The 1/2-inch cable has an N-type connector at each end. One end is connected to the IF interface of the ODU and the other end is connected with the IF jumper of the IDU.

NOTE

When the ISM8 board works with the XMC-3H ODU, if the distance between the IDU and the ODU is from 220 m to 300 m, the 1/2-inch common cable is used.

Cable Diagram

Figure 12-1 Diagram of the IF cable



1. RF coaxial cable connector, N-type, male
2. RF coaxial cable connector, TNC-type, male

Cable Connection Table

None.

Technical Specifications

Table 12-1 Performance of the IF cable

Item	Performance			
	5D Cable	RG-8U Cable	1/2-Inch Super-flexible Cable	1/2-Inch Common Cable
Characteristic impedance (ohm)	50	50	50	50
Attenuation (dB/100 m at 20°C)	≤ 10.0 (140 MHz) ≤ 11.0 (177 MHz) ≤ 15.0 (350 MHz) ≤ 18.0 (550 MHz)	≤ 6.0 (140 MHz) ≤ 7.0 (177 MHz) ≤ 9.0 (350 MHz) ≤ 11.0 (550 MHz)	≤ 5.0 (140MHz) ≤ 6.0 (177MHz) ≤ 6.63 (350MHz) ≤ 8.5 (550MHz)	≤ 2.8 (140MHz) ≤ 3.0 (177MHz) ≤ 4.5 (350MHz) ≤ 5.5 (550MHz)

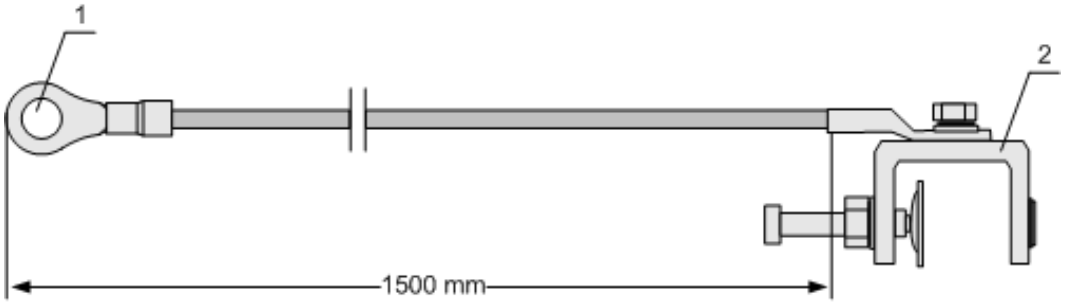
Item	Performance			
	5D Cable	RG-8U Cable	1/2-Inch Super-flexible Cable	1/2-Inch Common Cable
DC resistance (ohm/km at 20°C)	≤ 11.0	≤ 4.9	≤ 4.3	≤ 2.7
Outside diameter of the cable (mm)	7.60	10.16	13.40	15.7

12.2 PGND Cable of the ODU

The ODU PGND cable is used to connect the grounding screw of the ODU to the outdoor ground point such as the ground point on the tower so that the ODU can be connected to the outdoor grounding grid.

Cable Diagram

Figure 12-2 Diagram of the ODU protection ground cable



1. Naked crimping connector (OT type)
2. Grounding bar

Cable Connection Table

None.

13 Appendix

This chapter introduces information about frequency sub-band combination of XMC-3/ XMC-3W ODU.

13.1 Information about Sub-band Combination of XMC-3 ODU

This chapter introduces information about sub-band combination of XMC-3 ODU.

Table 13-1 shows the information about sub-band combination of 7 GHz frequency band.

Table 13-1 Frequency information of the 7 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154A/ 160A/161I	154A	7,427.00	7,485.00	7,581.00	7,639.00
	160A	7,433.50	7,496.50	7,593.50	7,656.50
	161I	7,414.00	7,484.00	7,575.00	7,645.00
154B/161J/ 168A	154B	7,456.00	7,526.00	7,610.00	7,680.00
	161J	7,449.00	7,512.00	7,610.00	7,673.00
	168A	7,443.00	7,499.00	7,611.00	7,667.00
154C/161S	154C	7,512.00	7,568.00	7,666.00	7,722.00

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
	161S **NOTE** This is special requirements;	7,508.50	7,568.00	7,669.50	7,729.00
154D/ 161Q/ 196A	154D	7,128.00	7,184.00	7,282.00	7,338.00
	161Q **NOTE** This is special requirements;	7,128.00	7,184.00	7,289.00	7,345.00
	196A	7,093.00	7,177.00	7,289.00	7,373.00
154E/ 161B/168E	154E	7,170.00	7,226.00	7,324.00	7,380.00
	161B	7,149.00	7,212.00	7,310.00	7,373.00
	168E	7,163.00	7,205.00	7,331.00	7,373.00
154F/161R	154F	7,212.00	7,268.00	7,366.00	7,422.00
	161R **NOTE** This is special requirements;	7,212.00	7,268.00	7,373.00	7,429.00
154G/ 160B/ 161K/168B	154G **NOTE** This is special requirements;	7,484.00	7,541.00	7,638.00	7,695.00
	160B	7,478.50	7,541.50	7,638.50	7,701.50
	161K	7,484.00	7,547.00	7,645.00	7,708.00
	168B	7,485.00	7,541.00	7,653.00	7,709.00

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154H/ 160C/ 161L/168C	154H **NOTE** This is special requirements;	7,539.00	7,569.00	7,693.00	7,723.00
	160C	7,526.00	7,589.00	7,686.00	7,749.00
	161L	7,519.00	7,582.00	7,680.00	7,743.00
	168C	7,527.00	7,583.00	7,695.00	7,751.00
161A/ 168D	161A	7,114.00	7,177.00	7,275.00	7,338.00
	168D	7,110.50	7,170.00	7,278.50	7,338.00
161C/ 168F/196B	161C	7,718.50	7,247.00	7,341.50	7,408.00
	168F	7,198.00	7,236.50	7,366.00	7,404.50
	196B	7,149.00	7,233.00	7,345.00	7,429.00
161D/ 168G/196C	161D	7,219.00	7,282.00	7,380.00	7,443.00
	168G	7,226.00	7,261.00	7,394.00	7,429.00
	196C	7,205.00	7,261.00	7,401.00	7,457.00
161E	161E	7,239.00	7,302.00	7,400.00	7,463.00
161F	161F	7,274.00	7,337.00	7,435.00	7,498.00
161G	161G	7,309.00	7,372.00	7,470.00	7,533.00
161H	161H	7,344.00	7,407.00	7,505.00	7,568.00
161M	161M	7,539.00	7,602.00	7,700.00	7,763.00
161N	161N	7,574.00	7,637.00	7,735.00	7,798.00
161O	161O	7,609.00	7,672.00	7,770.00	7,833.00
161P	161P	7,644.00	7,707.00	7,805.00	7,868.00
245A	245A	7,400.00	7,484.00	7,645.00	7,729.00
245B	245B	7,484.00	7,568.00	7,729.00	7,813.00
245C	245C	7,568.00	7,652.00	7,813.00	7,897.00

Table 13-2 shows the information about sub-band combination of 15 GHz frequency band.

Table 13-2 Frequency information of the 15 GHz frequency band (XMC-3 ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315A/ 322A	315A/ 322A	14,627.00	14,746.00	14,942.00	15,061.00
315B/322B	315B/ 322B	14,725.00	14,844.00	15,040.00	15,159.00
315C/ 322C/420B	315C/ 322C	14,823.00	14,942.00	15,138.00	15,257.00
	420B	14,718.00	14,928.00	15,138.00	15,348.00
420A	420A	14,501.00	14,725.00	14,921.00	15,145.00
490A	490A	14,403.00	14,634.00	14,893.00	15,124.00
490B	490B	14,627.00	14,858.00	15,117.00	15,348.00
644A/ 728A	644A	14,400.00	14,708.00	15,044.00	15,352.00
	728A	14,500.00	14,625.00	15,228.00	15,353.00

13.2 Information about Sub-band Combination of XMC-3W ODU

This chapter introduces information about sub-band combination of XMC-3W ODU.

NOTE

- The XMC-3W ODU is a wide-band ODU. The first columns in **Table 13-3** and **Table 13-4** list T/R spacing and sub-bands supported by the same ODU. For example, 154A/161A/168A/196X indicates that four T/R spacing and sub-bands are supported by one hop of ODU.
- The XMC-3W ODU T/R spacing and sub-band is newly defined. The mapping between T/R spacing and sub-bands of XMC-3W ODU and XMC-3 ODU is listed in the second and third columns of **Table 13-3** and **Table 13-4**.

Table 13-3 shows the information about sub-band combination of 7 GHz frequency band.

Table 13-3 Frequency information of the 7 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
154A/ 161A/ 168A/ 196X	154A	154D/ 154E/ 154F	7,128.00	7,268.00	7,282.00	7,422.00
	161A	161A/ 161B/ 161C/ 161D/ 161E/ 161F/ 161G/ 161H/ 161Q/ 161R	7,114.00	7,407.00	7,275.00	7,568.00
	168A	168D/ 168E/ 168F/ 168G	7,110.50	7,261.00	7,278.50	7,429.00
	196X	196A/ 196B/ 196C	7,093.00	7,261.00	7,289.00	7,457.00
154B/ 160X/ 161B/ 168B/ 245X	154B	154A/ 154B/ 154C/ 154G/ 154H	7,427.00	7,569.00	7,581.00	7,723.00
	160X	160A/ 160B/ 160C	7,433.50	7,589.00	7,593.50	7,749.00

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
	161B	161I/ 161S/ 161L/ 161M/ 161N/ 161O/ 161P/ 161K/ 161J	7,414.00	7,707.00	7,575.00	7,868.00
	168B	168A/ 168B/ 168C	7,443.00	7,583.00	7,611.00	7,751.00
	245X	245A/ 245B/ 245C	7,400.00	7,652.00	7,645.00	7,897.00

Table 13-4 shows the information about sub-band combination of 8 GHz frequency band.

Table 13-4 Frequency information of the 8 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
119X/ 126X	119X	119A/ 119B/ 119C	8,279.00	8,377.00	8,398.00	8,496.00

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
	126X	126A/ 126B/ 126C				
151.614X /208X	151.614X	151.614A/ 151.614B/ 151.614C	8,203.00	8,345.00	8,355.00	8,497.00
	208X	208A/ 208B/ 208C/ 208D	8,043.00	8,281.00	8,251.00	8,489.00
266X/ 310X	266X	266A/ 266B	7,905.00	8,136.00	8,171.00	8,402.00
	310X	310A/ 310B/ 310C	7,905.00	8,185.00	8,215.00	8,495.00
311.32X	311.32X	311.32A/ 311.32B	7,731.00	7,971.00	8,042.00	8,282.00

Table 13-5 shows the information about sub-band combination of 13 GHz frequency band.

Table 13-5 Frequency information of the 13 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
266A	266A	266A/ 266B	12,751.00	12,982.00	13,017.00	13,248.00

Table 13-6 shows the information about sub-band combination of 15 GHz frequency band.

Table 13-6 Frequency information of the 15 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
315A/ 322A/ 420A/ 475A/ 490A/ 644A/ 728A	315A/ 322A	315A/ 315B/ 315C/ 322A/ 322B/ 322C	14,627.00	14,942.00	14,942.00	15,257.00
	420A	420A/ 420B	14,501.00	14,928.00	14,921.00	15,348.00
	475A	N/A	14,500.00	14,883.00	14,975.00	15,358.00
	490A	490A/ 490B	14,403.00	14,858.00	14,893.00	15,348.00
	644A	644A	14,400.00	14,708.00	15,044.00	15,352.00
	728A	728A	14,500.00	14,625.00	15,228.00	15,353.00

Table 13-7 shows the information about sub-band combination of 18 GHz frequency band.

Table 13-7 Frequency information of the 18 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010A/ 1008A/ 1560A/ 1092.5A	1010A/ 1008A	1010A/ 1010B/ 1008A/ 1008B	17,685.00	18,700.00	18,695.00	19,710.00
	1560A	1560C	17,700.00	18,140.00	19,260.00	19,700.00
	1092.5A	1092.5A/ 1092.5B	17,712.50	18,595.00	18,805.00	19,687.50

Table 13-8 shows the information about sub-band combination of 23 GHz frequency band.

Table 13-8 Frequency information about the 23 GHz frequency band (XMC-3W ODU)

T/R Spacing (MHz) & Sub-Band	T/R Spacing (MHz) & Sub-Band	T/R Spacing & Sub-Band of the Corresponding XMC-3 ODU	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008A/ 1050A/ 1200A/ 1232A	1008A	1008A/ 1008B	21,990.50	22,610.00	22,998.50	23,618.00
	1050A	1050A	21,950.25	22,498.00	23,000.25	23,548.00
	1200A	1200A/ 1200B/ 1200C	21,200.00	22,400.00	22,400.00	23,600.00
	1232A	1232A/ 1232B	21,200.00	22,386.00	22,432.00	23,618.00