

HDBS-5000DW Series
4 SAT-IF & 1 CATV
DWDM Optical transmitter/receiver
950MHz~2400 MHz

Technical Specification

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1.0 PRODUCT DESCRIPTION

Huatai HDBS-5000DW series is putting C-Band ITU standard wavelength 4 SAT-IF and 1 CATV transmitter or optical receiver into a 1RU 19" standard chassis. Multiplexing 5 optic (TX) or de-multiplexing (RX) through DWDM, and transmit in one fiber. Can be used for high-quality transmission of the same satellite VL, VH, HL, HH different polarization of the 4-way SAT-IF signals and 1 way CATV signals. Installation flexibility.

DWDM index. One fiber can transmit 40 multiple optical signals in C-Band, 100GHz channel space. Can use EDFA amplifier to achieve long-distance, wide range FTTH, and compatible with every FTTx PON technique. Achieve DBS and Triple-play amalgamation.

HDBS-5000DW1 build-in DWDM. After 4 SAT-IF signal and 1 CATV signal multiplexing/de-multiplexing in the equipment, then input (RX) or output (TX) through a SC/APC in front panel or back panel.

HDBS-5000DW5 no build-in DWDM, 5 optic signal input or output through 5 SC/APC in front panel or back panel. Adopt external DWDM, can be multiplexing or de-multiplexing the 17 ways optic signal of 1pcs HDBS-5000DW5 and 3pcs HDBS-4000DW4, and transmit through one fiber. It used in transmitting 4 satellites different polarization of 16 SAT-IF signals and 1 CATV signal.

HDBS-5000DW optical transmitter adopts ITU wavelength can be tuned high linearity, with cooling DFB laser, direct modulated. High performance wavelength tuning and control circuit steadily then the working wavelength of the laser can be adjust and stabilize control in the range of ± 1.6 , and output power adjustable function adapt with DWDM. Perfect laser APC, ATC control circuit assures long life and high credibility working of the laser. CATV adopts pre-distortion compensation RF AGC drive circuit. SAT-IF with high linearity IF amplifier circuit of AGC adjustable, TG type. Also can choose no IF amplifier TO type. TO type allows high power level input.

Different CATV network of signal sources, transmission distance, the system of indicators demand is not exactly the same. HDBS-5000DW designed specifically for CATV four kinds of internal configuration model, can be adapted to different applications.

2.0 PRODUCT FEATURE

- Adopt DWDM, C-Band, 100GHz, ITU wavelength, transmit 4 ways, 8 ways, 16 ways, 32 ways SAT-IF optical signal in one fiber
- Can use EDFA to achieve long distance and big range FTTH
- Compatible with any FTTX PON technique. Triple-play compatible with DBS
- Can choose four internal configuration models to adapt different CATV network application
- 1RU standard chassis, combiner 4 SAT-IF and 1 CATV optical transmitter or optical receiver
- HDBS-5000DW1, build-in DWDM. multiplexing 5 optical signal and transmitter in one fiber
- HDBS-5000DW5, no DWDM build-in, 5 ways optical output (TX), or 5 ways optical input (RX)
- Adopt external DWDM can be 1 set HDBS-5000DW5 and 3 sets HDBS-4000DW4 with different polarization of the 16 SAT-IF and one way CATV optical signals of four satellites multiplexed in a fiber and transmit
- HDBS-5100DW adopt 19" standard chassis, LCD in front panel provides situation display and fault diagnose, standard RS232 communication interface, SNMP network management function
- HDBS-5200DW-RX adopt small size metal crust, convenient for connect Multiswitch to STB
- HDBS-5200DW-RW apply FTTx PON, seamless link with EPON, GPON's ONU
- High linearity, with cooling DFB laser, 1550nm ITU wavelength $\pm 1.6\text{nm}$ can be tuned
- Optical transmitter output power 0 ~ -3dBm adjustable, apply to DWDM
- CATV optical transmitter with pre-distortion compensation and AGC control
- SAT-IF optical transmitter, can choose with AGC high linearity IF amplify circuit, TG type. Also can choose no IF amplify TO type. TO type allows high power level input
- 4 ways optical transmitter can supply +13VDC or +18VDC to LNB
- Strong ability to anti-electromagnetism, RF and thunderbolt
- Agility and convenient for install and use
- The most excellent performance to price ratio in this industry

3.0 MAIN APPLICATION

- Multi-channel satellite SAT-IF and CATV signal over long distance and large area optical fiber distribute system
- Second-stage service area (substation, sub head end) CATV compatible with multi-channel satellite SAT-IF
- FTTx PON

4.0 TECHNICAL INDEX

Performance			Index	supplement
TX&RX Optical feature	Operating wavelength	(nm)	1528~1563	100GHz, ITU standard wavelength
	Wavelength adjustable range	(nm)	± 1.6	$\pm 200\text{GHz}$
	Wavelength adjustable mode		$\pm 0.05\text{nm}$ stepping	
	Wavelength stability	(pm/°C)	-1~0	TC=20~70°C
	Size mode suppression ratio	(dB)	>45	SMSR
	Equivalent noise level	(dB/Hz)	≤ -160	20~1000MHz(CATV)
			≤ -145	20~2700MHz(SAT-IF)
	Number of TX output port		1	HDBS-5106DW □-TX
			5	HDBS-5110DW □-TX
	TX output power ¹⁾	(dBm)	6 (4mW)	HDBS-5106DW □- TX
			10 (10mW)	HDBS-5110DW □- TX
	Number of RX output port		1	HDBS-5000DW1-RX
			5	HDBS-5000DW5-RX
	RX responsibility	(A/W)	≥ 0.9	1550nm
	RX input power range ¹⁾	(dBm)	0~-13	
	Number of RX output port		1	RW (for ONU)
	Return loss	(dB)	≥ 50	
	Connector		SC/APC	Optional FC/APC, LC/APC
	Laser type		Cooling DFB	TX with ISO
	Optical receive tube type		PIN	RX
SAT-IF feature	Operating bandwidth	(MHz)	950~2400	
	TX input level	(dBmV)	-25~-14	TG with IF amplification (AGC)
			-6~+10	TO without IF amplification

	RX output level		(dBmV)	-15~-40	
	Flatness		(dB)	0.5	40MHz
				±1.0	950~2400MHz
	Input impedance		(Ω)	75	
	RF return loss		(dB)	12	
	RF connector			F-female	
	C/IM3 ²⁾		(dB)	≥55	
	Equivalent noise level		(dB/Hz)	>115	
	Link gain ³⁾		(dB)	25	
CATV adopt DMTX feature	Operating bandwidth		(MHz)	45~862	
	Input level (Pin)		(dBmV)	15~25	AGC
	Flatness		(dB)	≤±1.0	45~862MHz
	Return loss		(dB)	>16	
	RF connector			F-Female	
	Impedance		(Ω)	75	
	CNR		(dB)	≥50.5	PAL-D/60CH
	CTB		(dB)	≤-63	
	CSO		(dB)	≤-58	≤600MHz
				≤-53	>600MHz
	Transmission distance		(Km)	5	D05
				10	D10
				15	D15
General feature	Serial interface			RS232	
	SNMP network management interface			RJ45	
	Power supply		(V)	95~260VAC	
	Power consume		(W)	<50	
	Operating temp.		(℃)	-5~+65	
	Relative humidity		(%)	<85	
	Size	HDBS-5100	(mm)	483×267×44	(W) × (D) × (H)
		HDBS-5200		263×198×35	(W) × (D) × (H)

Remarks: 1. DWDM insertion loss is not included.

2. C/IM3 is defined as the ratio between the peak of carrier signal and triple beat (IM3) by using a two-tone test (1.0GHz and 1.1GHz).

3. -40dBm RF input test

5.0 LINK PERFORMANCE

5.1 SAT Link performance

Optical fiber input (dB)	Link loss (dB)	CNR (dB)	Link gain (dB)	RF output level (dBm/Ch.)
-13	14	30.18	-2	-38
-12	13	32.18	0	-36
-11	12	34.13	2	-34
-10	11	38.59	6	-32
-8	9	40.11	8	-30
-7	8	42.18	10	-28
-6	7	44.24	12	-26
-5	6	45.67	14	-24
-4	5	46.53	16	-22
-3	4	46.76	18	-20
-2	3	46.92	20	-18
-1	2	47.01	22	-16
0	1	47.03	24	-14

Note; 1. DWDM insert loss is not include, TX Output=6dBm

2. Digital satellite receiver input level typical is -60dBm ~ -30dBm

5.2 CATV optical receiver test data

Pin (dBm)	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11
Vo (dBμV)	90.7	88.7	86.7	84.7	82.7	80.7	78.7	76.7	74.7	72.7	70.7
CNR (dB)	56.1	55.6	54	53	51.7	50.3	49.1	48.2	46.8	45.5	43.7
CTB (dB)	63	65	65	65	65	67	68	67	65	65	65
CSO (dB)	62	63	64	65	65	65	65	65	63	63	63

Note: 1、test situation: PAL-D59CH, OMI=3.8%

2、DWDM inset loss is not include

6.0 100GHz DWDM technique parameter

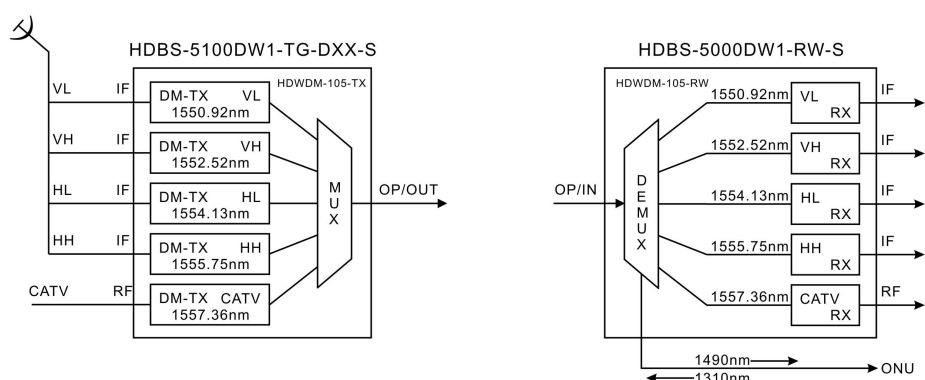
Performance			HDWDM-108	HDWDM-116	HDWDM-132
Working wavelength		(nm)	C/L-Band		
Working center wavelength		(nm)	ITU		
Center wavelength accuracy		(nm)	±0.3		
Channel spacing		(GHz)	100		
Channel band pass (@-0.5dB bandwidth)		(nm)	≥0.22		
Band pass insert loss (without connector)		dB	≤3.0	≤5.2	≤10.0
Channel consistency		(dB)	≤1.5	≤2.0	≤3.0
Channel ripple		(dB)	≤0.5		
Isolation	Border upon	(dB)	≥30		
	Not border upon		≥40		
Polarization dependence loss		(dB)	≤0.15		
Polarization mode dispersion		(ps)	≤0.10		
Direction		(dB)	≥50		
Return loss		(dB)	≥50		
Pass power		(mW)	≤500		
Connector type			NO		
Optical fiber type			SMF-28e with 900um loose tube		
Optical fiber length		(m)	≥1.0 (module type)		
Working temperature		(℃)	0~+70		
Storage temperature		(℃)	-40~+85		
Optical fiber connector			SC/APC, adjustable LC/APC、FC/APC		
Size	Module	(mm)	120 X 80 X 12	120 X 80 X 18	1420 X 115 X 14.5
	19″ rack	(″)	19 X 10 X 1.75		

7.0 HDBS-5000DW Internal configuration frame

Since the standard single-mode fiber dispersion in the 1550nm window and the direct modulation chirp effect each other, it will have a serious deterioration in analog CATV application, so limiting the CATV transmission distance. In order to meet different network applications, HDBS-5000DW has four kinds of internal configuration modes to CATV signal source and modulation methods.

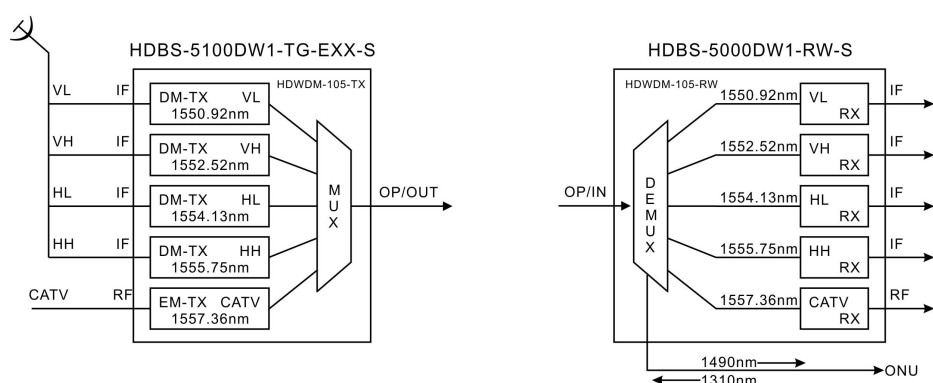
7.1 D type: CATV adopt direct modulate

Optical transmitter build-in 5sets DM-TX used for SAT-IF and CATV. Analog CATV service radii could choose 5km, 10km and <15Km. (DTV QAM): 40KM.



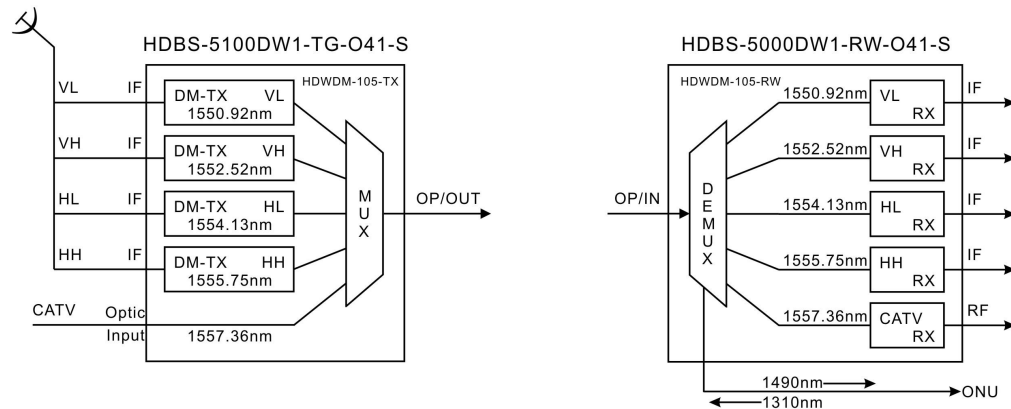
7.2 E type: CATV adopt external modulate

Optical transmitter build-in 4sets DM-TX and 1set EM-TX, 2RU rack. Because of CATV adopt external modulate the limited of transmitter distance canceled. It can be used in head-end and large service area. External modulate optical transmitter can choose HT8520, HT8516.



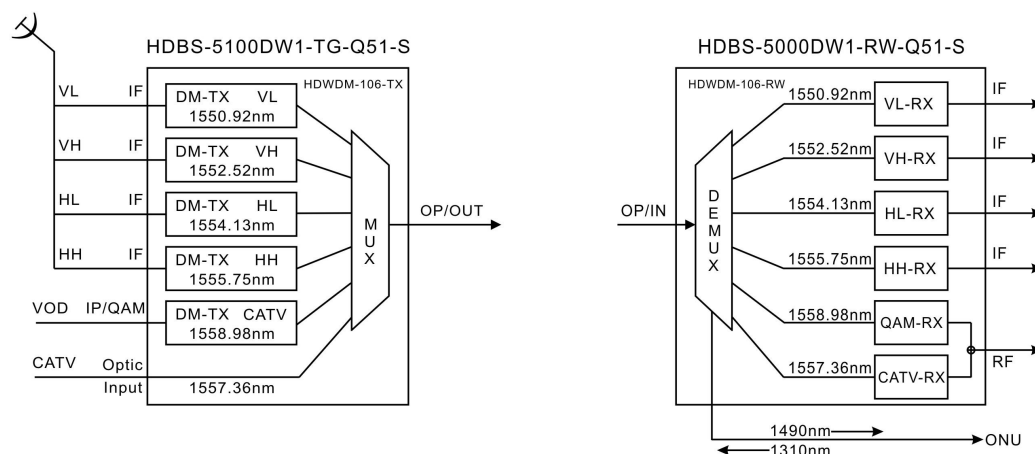
7.3 O type: CATV optical signal input through exterior

Optical transmitter build-in 4sets DM-TX, no CATV-TX. CATV optical signal input through the SC/APC connector in the panel, after multiplexing with inside DWDM then output. This CATV signal may be is the signals in the sub-head end transmit from the head end. It applicable to sub-head end in the full optical relay.



7.4 Q type: CATV input through exterior, add one set DM-TX which is use VOD of IP/QAM

Optical transmitter build-in 5sets DM-TX, 4sets used for SAT-IF, 1set use for IP/QAM (VOD), CATV optical signal input through external, then multiplexing with inside DWDM-106 (6 wavelength) then output. It applicable to sub-head end in the full optical relay.



8.0 Wavelength configuration table

8.1 ITU-TG 692 C-Band 100GHz(0.8nm) wavelength table

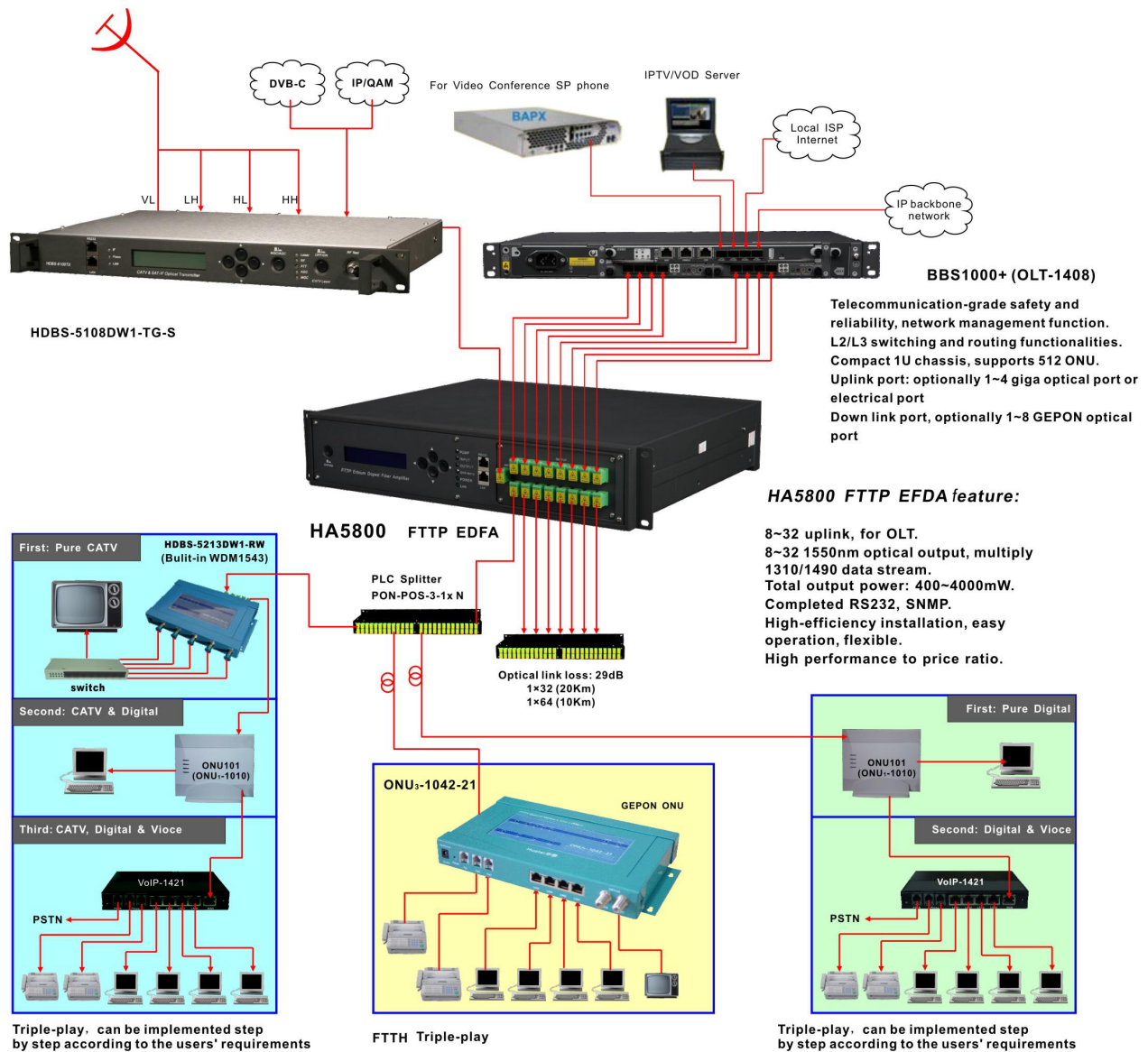
Channel number	Frequency (THz)	Working wavelength (nm)	Channel number	Frequency (THz)	Working wavelength (nm)
61	196.1	1528.77	38	193.8	1547.72
60	196.0	1529.55	37	193.7	1545.32
59	195.9	1530.33	36	193.6	1548.51
58	195.8	1531.12	35	193.5	1549.32
57	195.7	1531.90	34	193.4	1550.12
56	195.6	1532.68	33	193.3	1550.92
55	195.5	1533.47	32	193.2	1551.72
54	195.4	1534.25	31	193.1	1552.52
53	195.3	1535.04	30	193.0	1553.33
52	195.2	1535.82	29	192.9	1554.13
51	195.1	1536.61	28	192.8	1554.94
50	195.0	1537.40	27	192.7	1555.75
49	194.9	1538.19	26	192.6	1556.55
48	194.8	1538.98	25	192.5	1557.36
47	194.7	1539.77	24	192.4	1558.17
46	194.6	1540.56	23	192.3	1558.98
45	194.5	1541.35	22	192.2	1559.79
44	194.4	1542.14	21	192.1	1560.61
43	194.3	1542.94	20	192.0	1561.42
42	194.2	1543.73	19	191.9	1562.23
41	194.1	1544.53	18	191.8	1563.05
40	194.0	1546.12	17	191.7	1563.86
39	193.9	1546.92			

8.2 HDBS-5000DW1 standard wavelength configuration (S)

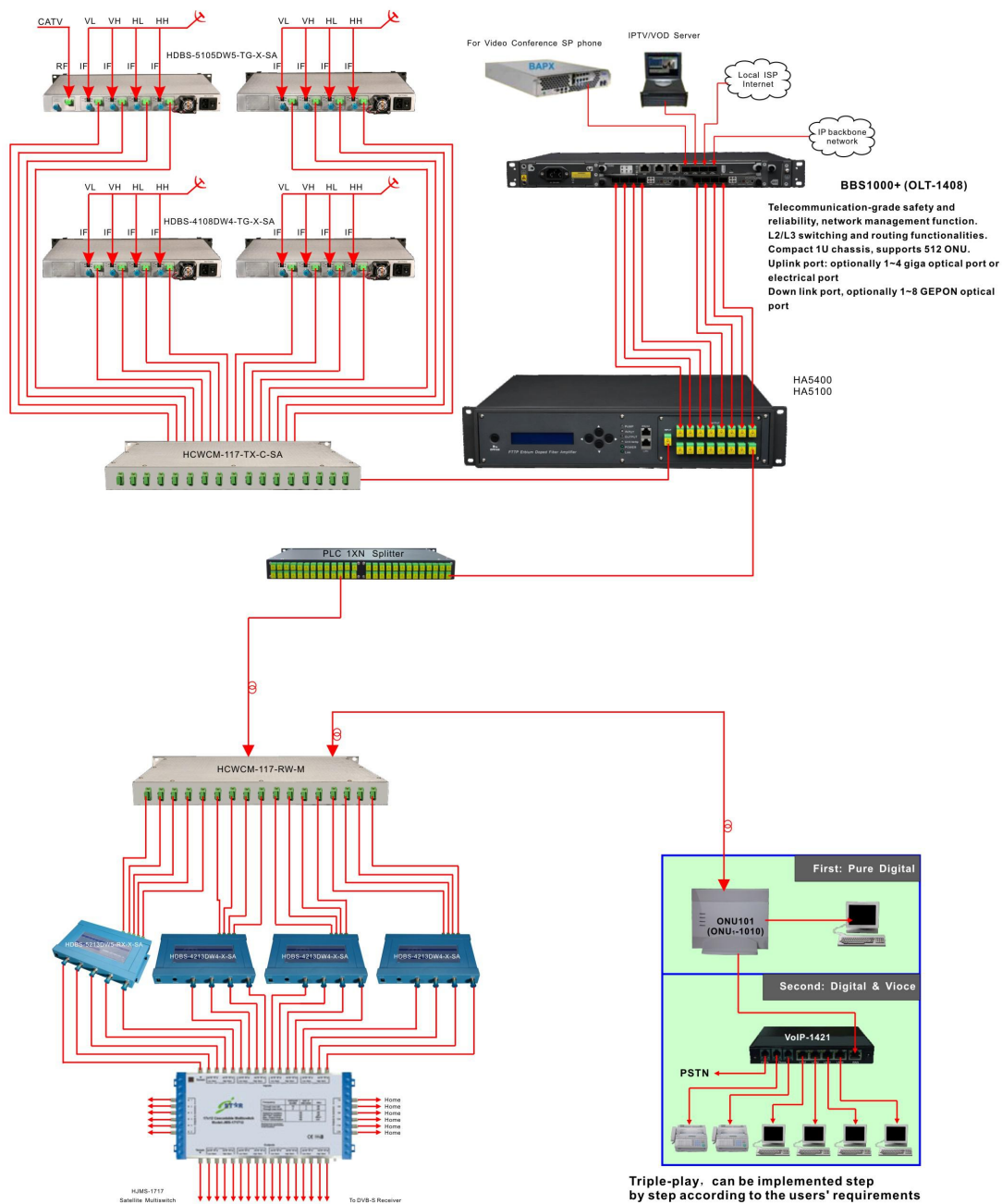
VL-SAT-IF	1550.92nm	VH-SAT/RF	1552.52nm
HL-SAT-IF	1554.13nm	HH-SAT-IF	1555.75nm
CATV-RF	1557.36nm	IP/QAM/RF	1558.98nm

9.0 Network application (P2MP)

9.1 HDBS-5000DW1 apply in FTTx PON



9.2 HDBS-5000DW5 APPLY IN TRANSMIT MULTI SAT-IF



10.0 Product series

10.1 TX & RX

Model	Output power (dBm)		RX number		Optical port number			Wavele ngth configu ration	Optical connect or	
	SAT-IF	CATV	SAT-IF	CATV	Input	Output	Pass			
HDBS-5106DW1-TG-D05-S	6	6				1		S	SC/APC	
HDBS-5106DW1-TG-D10-S										
HDBS-5106DW1-TG-D15-S										
HDBS-5110DW1-TG-D05-S	10	10				1		S		
HDBS-5110DW1-TG-D10-S										
HDBS-5110DW1-TG-D15-S										
HDBS-5106DW5-TG-D05-X	6	6				5		X		
HDBS-5106DW5-TG-D10-X										
HDBS-5106DW5-TG-D15-X										
HDBS-5110DW5-TG-D05-X	10	10				5		X		
HDBS-5110DW5-TG-D10-X										
HDBS-5110DW5-TG-D15-X										
HDBS-5106DW1-TG-E16-S	6	6				1		S		
HDBS-5106DW5-TG-E16-X						5		X		
HDBS-5110DW1-TG-E10-S	10	10				1		S		
HDBS-5110DW5-TG-E10-X						5		X		
HDBS-5106DW1-TG-O41-S	6	0				1		S		
HDBS-5110DW1-TG-O41-S	10									
HDBS-5106DW1-TG-Q51-S	6	6				1		S		
HDBS-5110DW1-TG-Q51-S	10	10								
HDBS-5113DW1-RX-R41-S			4	1	1			S		
HDBS-5113DW1-RX-R42-S				2						
HDBS-5113DW5-RX-R41-X			4	1	5			X		
HDBS-5113DW6-RX-R42-X				2	6					
HDBS-5113DW1-RW-R41-S			4	1	1		1	S		
HDBS-5113DW1-RW-R42-S				2						
HDBS-5113DW5-RW-R41-X			4	1	5		1	X		
HDBS-5113DW6-RW-R42-X				2	6					

Note: 1、CWDM insert loss is not include.

2、TX can choose TO type, without IF amplify

10.2 DWDM

Model	Exterior	Optical port number			Pass wavelength	Optical connector
		Output	Input	Pass		
DWDM-104-TX-C-SA	19" rack	1	4		adjustable	SC/APC
DWDM-108-TX-C-SA		1	8			
DWDM-116-TX-C-SA		1	16			
DWDM-132-TX-C-SA		1	32			
DWDM-104-RX-C-SA	19" rack	4	1			
DWDM-108-RX-C-SA		8	1			
DWDM-116-RX-C-SA		16	1			
DWDM-132-RX-C-SA		32	1			
DWDM-104-RW-C-SA	19" rack	4	1	1	1310/1490	
DWDM-108-RW-C-SA		8	1	1	1310/1490	
DWDM-116-RW-C-SA		16	1	1	1310/1490	
DWDM-132-RW-C-SA		32	1	1	1310/1490	

Note: 1、Module type adjustable (M)。

2、Channel number and channel wavelength can by specify by users

11.0 order information

11.1 TX & RX

HDBS - 5 □ □ □ - DW □ - □ □ - □ □ □ / □ - □ / □ □ - □ □

Satellite broadcast L-Band fiber link products (DBS)	Product type	Product feature	SAT-IF output power	Multiplex mode	Number of output port	Type	TX configuration	Wavelength configuration	Optical port position	Connector	Power supply
5	4×SAT-IF or 1×CATV assemble	1 19" standered type	06 6dBm (4mW)	DW DWDM 1528~1563nm 1TU wavelength	1 Built-in DWDM 1 output port	TG TX with IF amplification	D05 DM-TX 5Km for CATV	S Standard layout	F Front panel	SA SC/APC	48 -48VDC
		2 RX small ferrous box	10 10dBm (10mW)					C Customer specified	B Back panel	FA FC/APC	22 220VAC
	1 5~2700MHz										
	2 CATV-RF(47~862MHz)& SAT-IF(950~2200MHz)										
	3 SAT-IF 950~2400MHz										
	4 4×SAT-IF assemble										
	6 950~8000MHz										

RX receive sensitivity

SAT-IF output power	Multiplex mode	Number of output port	Type	TX configuration	Wavelength configuration	Optical port position	Connector	Power supply
06 6dBm (4mW)	DW DWDM 1528~1563nm 1TU wavelength	1 Built-in DWDM 1 output port	TG TX with IF amplification	D05 DM-TX 5Km for CATV	S Standard layout	F Front panel	SA SC/APC	48 -48VDC
10 10dBm (10mW)					C Customer specified	B Back panel	FA FC/APC	22 220VAC
13 -13dBm	CW CWDW 1270~1610nm 18 wavelengths	5 Without DWDM 5 output ports	TO TX without IF amplification	D10 DM-TX 10Km for CATV				
			RX Optical receiver	D15 DM-TX 15Km for CATV				
			RW RX built-in CWDW1543 for PON	E16 EM-TX fiber 6dBm for CATV				
				E18 EM-TX fiber 8dBm for CATV				
				E10 EM-TX fiber 10dBm for CATV				
				O41 4×DM-TX 1×optical input				
				Q51 5×DM-TX 1×optical input				
				RX configuration				
				R41 5×RX held for D.E.O				
				R42 6×RX held for Q				

Add: Wavelength configuration list.

	S (standard configure)	X(customer specify)
TX1 (VL)	1550.92nm	
TX2 (VH)	1552.52nm	
TX3 (HL)	1554.13nm	
TX4 (HH)	1555.75nm	
TX5 (CATV)	1557.36nm	

11.2 DWDM

DWDM - □□ - □ - □ - □ - □ / □□

DWDM wavelength division multiplexer	Channel space		Number of channel		Mode		Type		Optical port position		Connector		
	10	100GHz (0.8mm)	04	4CH	TX	Multiplexer	M	Mode	F	Front panel	00	Without	
	20	200GHz (1.6mm)	08	8CH	RX	Division	C	19" stander	B	Back panel	SA	SC/APC	
			16	16CH	RW	1310/1490nm pass to ONU						FA	FC/APC
			32	32CH			LA	LC/APC					
			02	2CH									

ENCLOSE: CHANNEL WAVELENGTH CONFIGURATION