HFA5000 CATV Separate Raman Amplifier

PRODUCT DESCRIPTION

1. Erbium-doped Fiber Amplifier, due to multiple cascades and the accumulation of noise caused by spontaneous emission, will reduce the system CNR greatly and thus it will limit the transmission capacity and distance of the system. Raman Fiber Amplifier (RFA) is a newly designed fiber amplifier based on Stimulated Raman Scattering (SRS) effect. It is considered as the core technology of new generation DWDM fiber over-long communication. Compared with Erbium-Doped Fiber Amplifier, Raman amplifier has the advantage of low Noise Figure (NF), wider gain bandwidth, flexible gain spectral region and stable temperature. It is the only device that can operate in 1300~1600nm.

2. The gain medium of EDFA is Erbium-doped Fiber (EDF). It is a separated amplifier and its signal light can only be amplified after putting into EDFA. The gain medium of Distributed Raman Amplifier is Single Mode Fiber (SMF) which is for signal light transmission. Its gain area is distributed at long transmitting fiber that is 25km from the output end. That is to say, the signal light is amplified 25km before it reaches the output end of the transmitting fiber.

3. Low noise figure marks the super advantages as following:

① During Single Mode Fiber(G.652) transmission, adopting Distributed Raman Amplifier, it can reduce the loss for 5.5dB (Typical value) at effective cross-distance. Compared with EDFA, it equals that the effective distance is reduced for 25km, (fiber loss is calculated as 0.22dB/km). Therefore, the input power to the fiber is reduced and the damage of fiber non-linearity effect (SBS) is weakened.

② In OSNR calculation, the Equivalent Noise Figure of distributed backward pump Raman Amplifier is 0dB, typical value 0 ~ -2dB, which has remarkable help for improvement of cross-band length, increase system OSNR and transmission distance.

4. But Raman amplifier also has its disadvantages. Its gain is very low, not exceed 16 dB in actual application. Although the noise figure of EDFA is incomparable with Raman amplifier, its small signal gain can be higher that 30dBm. So the Raman amplifier is always combined with EDFA in system application. Hybrid Raman Amplifier combined both the two amplifier is an idea solution.

When an backward EDFA (If GP=10dBm, NF=5.5Db) combines with one pre-distributed Raman Amplifier (if GP=10dB, NF=-0.5dB), the gain of hybrid Raman amplifier (Raman + EDFA) will reach to GP=200Db and NF=0.96dB.

5. HFA5000 is a combination of RFA and EDFA to get flat Gain spectrum and high Optical Signal Noise Ratio (OSNR) . The un-relayed distance can be extended up to 30~50km and CNR can be improved for 4.5~6dB.

PRODUCT FEATURES

▶Perfect laser APC, AGC, ATC closed-looped circuit ensuring long life and stable operation of the pump laser.

▶Low noise figure and flat gain.

▶Adopts famous Fitel Raman pump laser.

▶Different raman gain and EDFA output power optional ， be suitable for different network.

▶Optimized structure, easy to use.

MAIN APPLICATION

▶Fiber CATV system, extra-long trunk that is inconvenient for building relay station.

Relay distance > 60Km.

Single span distance > 80Km.

▶DWDM, CATV extra-long trunk optical transmission system.

▶Submarine optical transmission system.

TECHNICAL INDEX

Performance			Index			Supplement
			Min.	Typ.	Max.	
Optic feature	Wavelength	(nm)	1528		1563	HFA5000 C-Band
	Pump optic transmission power	(mW)	400			
	Raman switch gain	(dB)	7	8	9	HFA5008
			9	10	11	HFA5010
			11	12	13	HFA5012
			13	14	15	HFA5014
			15	16	16.5	HFA5016
	EDFA gain	(dB)	10			
	EDFA output power	(dB)	13			
	Gain flatness	(dB)		1.0		HFA5000/F (With GFF)
				2.0		HFA5000 (Without GFF)
	Noise flgure	(dB)			4.5	
	Polarization mode dispersion	(ps)			0.2	
	Polarization dependence gain	(dB)			0.4	
	Polarize related loss	(dB)		0.1		
General feature	Work voltage	(V)	90		250	-48VDC optional
	Power Consume	(W)		30		
	Work temp	(℃)	0		60	
	Storage temp	(℃)	-40		+85	
	Relative humidity	(%)	5		95	
	Size (W)×(D)×(H)	(mm)	483×368×44			1U
			483×368×88			2U

Notes: work wavelength and pumping optical power can be tailored according to the customer's request.

PRODUCT SEREIS

Model	Work wavelength (nm)	Gain flatness (dB)	Raman Switch gain (dB)
HFA5008-13	1528~1563	<±2	8±1.0
HFA5010-13	1528~1563	<±2	10±1.0
HFA5012-13	1528~1563	<±2	12±1.0
HFA5014-13	1528~1563	<±2	14±1.0
HFA5016-13	1528~1563	<±2	16 (-1~+0.5)
HFA5008-13/F	1528~1563	<±1	8±1.0
HFA5010-13/F	1528~1563	<±1	10±1.0
HFA5012-13/F	1528~1563	<±1	12±1.0
HFA5014-13/F	1528~1563	<±1	14±1.0
HFA5016-13/F	1528~1563	<±1	16 (-1~+0.5)

Notes: 1. Optical raman amplifier with opposite phase PUMP (phasing back PUMP).

2. F model, built-in gain flatness filter GFF.

3. F model, built-in gain flatness filter GFF.

4. F model, built-in gain flatness filter GFF.

MODEL EXPLANATION

HFA 50 □□ - □□ / □

Guangtai Raman Optical Amplifier		Wavelength		Raman Switch Gain		EDFA output power		Gain flatness	
RFA	Separate Raman optical amplifier	50	C-Band	08	7~8.5dB	13	13dBm	O	Without GFF <±2.0
HFA	Hybrid Raman/Er-doped optical amplifier	60	L-Band	10	9~10.5dB	14	14dBm		
DRA	Separate dispersion compensation Raman optical amplifier			12	11~12.5dB	15	15dBm	F	With GFF <±1.0
				14	13~14.5dB	16	16dBm		
						17	17dBm		