

MODELING OF CHARACTERISTICS OF FIBER OPTICAL AMPLIFIERS FOR INFOCOMMUNICATION SYSTEMS

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This article discusses fiber optic amplifiers used in fiber optic transmission systems. Methods of modeling their characteristics are demonstrated.

Fiber optic amplifiers (HEU) are most widely used in fiber optic transmission systems. This is due to a number of their undeniable advantages:

- simplicity of design;
- high reliability;
- large gains;
- small noises;
- wide gain band;
- insensitivity to polarization of amplified light, etc.

The functional diagram of the HEU is shown in Figure 1.

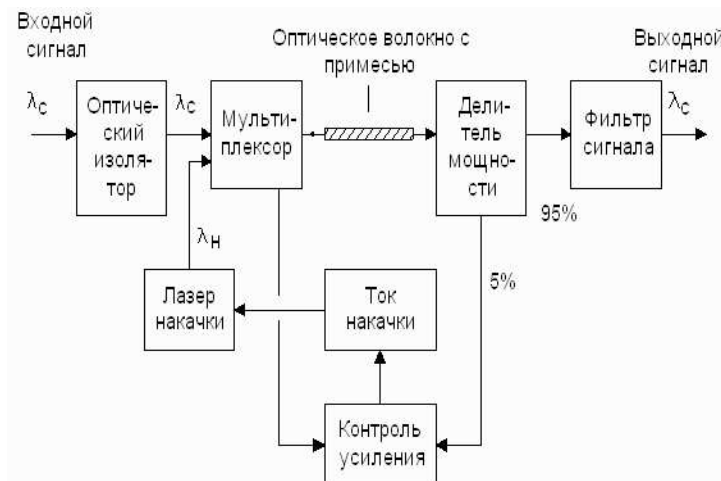


Figure 1. – The functional diagram of the HEU

The most important characteristics of fiber amplifiers are given in table 1.

Table 1. – Characteristics of fiber amplifiers

Transparency windows	0,82-0,85 μm		1,28-1,33 μm		1,53-1,56 μm	
	Advance Admission	Transmit power	Advance Admission	Transmit power	Advance Admission	Transmit power
Chemical compound	Tm ³⁺ +SiO ₂		Pr ³⁺ +SiO ₂		Er ³⁺ +SiO ₂	
The purpose of the amplifier	Advance Admission	Transmit power	Advance Admission	Transmit power	Advance Admission	Transmit power
Amplification value, dBm	25	10 - 12	20 - 30	10 - 15	35 - 50	10 - 15
Amplification frequency band, nm	100	100	90	90	40	40
Pump power, mW	40 - 60	40 - 80	60 - 80	100 - 150	60 - 80	100 - 150
Power consumption, W	4	7,5	5	8	2,4	7,5

For clarity, some characteristics are shown in Figures 2, 3, 4. These are the dependences of the gain on the length of the active fiber, the pump power, and the input signal.

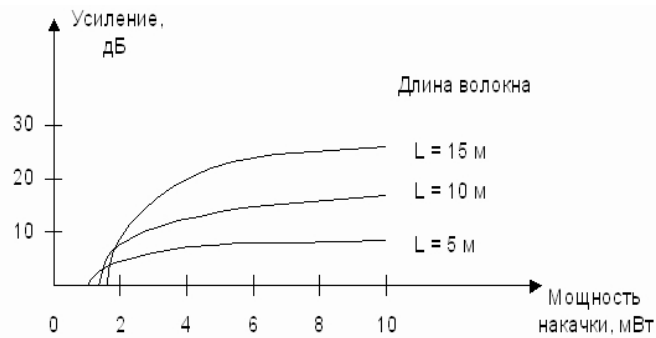


Figure 2. – Amplification of an erbium amplifier depending on fiber length and pump power

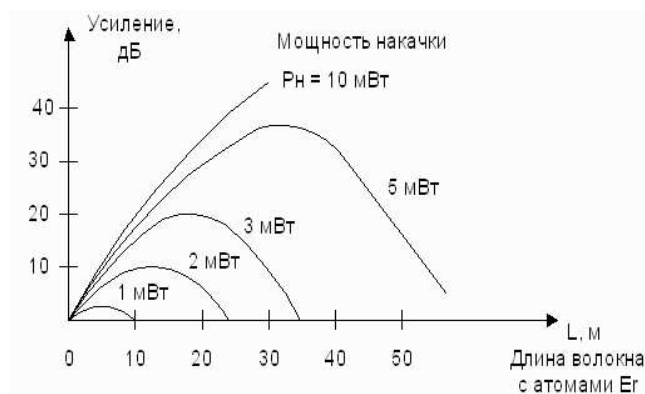


Figure 3. – Amplification of an erbium amplifier depending on fiber length and pump power

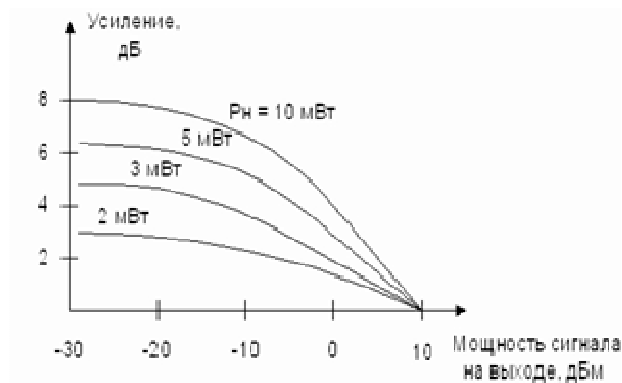


Figure 4. – Amplification of an erbium amplifier depending on the output signal

Fiber optic amplifiers can have a large non-uniformity of the amplitude-frequency characteristic, which is unacceptable for multi-wave transmission systems (systems with WDM). A number of solutions are known for smoothing the frequency response of erbium amplifiers and expanding their gain frequency band, for example, using automatically tunable attenuators for each transmission wave.

REFERENCES

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