the EDFA performance parameters has been presented by considering the pump power, pump wave length, Erbium-doped fiber length, and input signal levels and their spectral range. Short EDFA length and low pump power are desirable for practical and affordable purposes and it was shown that average gain of 23dB and gain flatness of 0.299dB were obtained at the shortest optimum fibre length of 4.73625m of and lowest optimum pump power of 24.9567mW for 16-channel simultaneous amplification. The gain flatness of 12 nm (from 1546nm to 1558nm) bandwidth was demonstrated. The output power of 8.798339dBm and an average noise figure of 6.5dB were obtained from the simulation.

References

[1] E. Desurvire, D. Bayart, B. Desthieux, and S. Bigo, *Erbium-Doped Fiber Amplifiers: Device and System Developments*. New York: John Wiley and sons, Inc., 2002.

[2] Y. Sun, A. K. Srivastava, J. Zhou, and J. W. Sulhoff, "Optical fiber amplifiers for WDM optical networks," *Bell Labs Technical Journal,* vol. 4, pp. 187-206, 1999. http://dx.doi.org/10.1002/bltj.2153

[3] P. C. Becker, N. A. Olsson, and J. R. Simpson, *Erbium-doped fiber amplifiers: fundamentals and technology* vol. 1. New York: Academic Press, 1999.

[4] H. Ono, M. Yamada, T. Kanamori, S. Sudo, and Y. Ohishi, "1.58-\ mum Band Gain-Flattened Erbium-Doped Fiber Amplifiers for WDM Transmission Systems," *journal of lightwave technology,* vol. 17, p. 490, 1999.

[5] G. Levesque and V. Oliver, *Guide to WDM Technology and Testing*. Canada: Electro-optical Engineering Inc., 2000.

[6] S. Park, H. Kim, C. Park, and S. Y. Shin, "Doped fibre length and pump power of gain-flattened EDFAs," *Electronics Letters,* vol. 32, pp. 2161-2162, 1996. http://dx.doi.org/10.1049/el:19961436

[7] W. Imajuku and A. Takada,"Gain characteristics of coherent optical amplifiers using aMach-Zehnder interferometer with Kerr media," *IEEE Journal of Quantum Electronics,* vol. 35, pp. 1657-1665, 1999. http://dx.doi.org/10.1109/3.798089

[8] J. C. Dung, S. Chi, and S. Wen, "Gain flattening of erbium-doped fibre amplifier using fibre Bragg gratings," *Electronics Letters,* vol. 34, pp. 555-556, 1998. http://dx.doi.org/10.1049/el:19980446

[9] P. F. Wysocki, J. B. Judkins, R. P. Espindola, M. Andrejco, and A. M. Vengsarkar, "Broad-band erbium-doped fiber amplifier flattened beyond 40 nm using long-period grating filter," *Photonics Technology Letters, IEEE,* vol. 9, pp. 1343-1345, 1997. http://dx.doi.org/10.1109/68.623257

[10] M. Rochette, M. Guy, S. LaRochelle, J. Lauzon, and F. Trepanier, "Gain equalization of EDFA's with Bragg gratings," *Photonics Technology Letters, IEEE,* vol. 11, pp. 536-538, 1999. http://dx.doi.org/10.1109/68.759390

[11] I. B. Sohn, J. G. Baek, N. K. Lee, H. W. Kwon, and J. W. Song, "Gain flattened and improved EDFA using microbending long-period fibre gratings," *Electronics Letters,* vol. 38, pp. 1324-1325, 2002. http://dx.doi.org/10.1049/el:20020915

[12] I. B. Sohn and J. W. Song, "Gain flattened and improved double-pass two-stage EDFA using microbending long-period fiber gratings," *Optics Communications,* vol. 236, pp. 141-144, 2004. http://dx.doi.org/10.1016/j.optcom.2004.03.063

[13] S. Su, R. Olshansky, D. Smith, and J. Baran, "Flattening of erbium-doped fibre amplifier gain spectrum using an acousto-optic tunable filter," *Electronics Letters,* vol. 29, pp. 477-478, 1993. http://dx.doi.org/10.1049/el:19930319

[14] S. H. Yun, B. W. Lee, H. K. Kim, and B. Y. Kim, "Dynamic erbium-doped fiber amplifier based on active gain flattening with fiber acoustooptic tunable filters," *Photonics Technology Letters, IEEE,* vol. 11, pp. 1229-1231, 1999. http://dx.doi.org/10.1109/68.789700

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