

Editorial

Optical amplifiers for communication

From time to time this journal publishes Special Issues and Special Sections on topics of current interest in the field of optoelectronics. One such was the Special Section on Optical Amplifiers for Communication which appeared in August 1990 and contained ten papers giving a broad coverage of the subject. The Guest Editors responsible for this special section were Mike O'Mahony (British Telecom) and Anthony Boucouvalas (Hewlett-

Packard), and although their contribution was not made known in the August issue, they are to be congratulated on stimulating such a significant and useful set of papers. In place of the customary editorial with the special section, we publish below their summary of progress to date on optical amplifiers.

M.J. ADAMS
P.J.R. LAYBOURN

Research into optical amplifiers and their applications has accelerated in recent years to the point where fibre amplifiers are now available commercially from a number of sources. Although the idea of optical amplification is as old as lasers, the telecommunication emphasis became predominant within the last decade. Developments in semiconductor laser technology and fibre coupling techniques meant that optical amplifiers exhibiting net gain could be realised.

By the mid 80's there was considerable activity in assessing semiconductor amplifiers in system applications, a major thrust being the replacement of optoelectronic regenerators in optical systems. The advantages of system transparency were being glimpsed which would allow capacity upgrading with changes necessary only in the terminal equipment. The wide bandwidth associated with optical amplifiers would also enable a practical realisation of WDM systems. These initial experiments, however, showed many of the problems associated with semiconductor optical amplifiers. Polarisation sensitivity, gain saturation at low output powers and low overall gain due to fibre to facet coupling losses made these devices less than ideal. Engineers and physicists being what they are, a number of these problems were tackled and overcome.

Today semiconductor amplifiers with high saturation powers and low polarisation sensitivity are available. Research into devices using multi quantum well materials is already yielding exciting results, with bandwidth greater than 100 nm and saturation powers in excess of 100 mW measured.

The last few years, however, have seen remarkable progress in the development of erbium fibre optical amplifiers. These devices exhibit no polarisation sensitivity and give high gains for modest pump powers. Since the amplifiers are based on a silica fibre host they can be spliced into the system fibre with very low loss. They are extremely robust in field use and will be used in real systems within a few years.

The optical amplifier is more than a component which can replace an optoelectronic regenerator. Its properties will enable new network topologies to be developed which will exhibit high degrees of resilience, reliability and flexibility. Using optical amplifiers, the power budget limitations of optical passive networks may be overcome and such networks could be extended. Optical amplifiers

may well play a role in optical instrumentation by first enhancing the performance of existing devices as well as increasing their functionality and flexibility.

It is our opinion that Optical Amplification will become a much studied topic in the 90's and optical amplifiers will be important components for the study of nonlinear effects in systems and networks of the future.

M. O'MAHONY
A.C. BOUCOUVALAS



Anthony C. Boucouvalas was born in Stenies, Island of Andros, Greece, in 1957. He graduated from the University of Newcastle upon Tyne, Newcastle upon Tyne, England, in 1978. In 1979 he received the DIC and MSc degrees in Communication Engineering, from Imperial College, London, where in 1982 he received the PhD degree. In 1984, after a year National Service in the Army, he joined GEC Research Laboratories, Hirst Research Centre, Wembley, England, where he became a Group Leader and Department Chief Scientist, working optical fibre components, measurements and sensors. In 1987 he joined Hewlett-Packard Laboratories, Bristol, where he is now a Project Manager, working on optical communications for LANs.



Mike J. O'Mahony was born on August 28, 1944. He graduated from Essex University, Colchester, England in 1974 and in 1977 received the PhD degree for research in digital transmission systems.

He joined the Optical System Research Division of British Telecom in 1979 working on research into fibre-optic systems with emphasis on underseas systems, and on receiver and transmitter design and theoretical system studies. In 1984 he became a Group Leader responsible for the study and application of optical amplifiers to transmission systems. In 1988 he became a Head of Section responsible for inland long haul optical systems and networks. The work of the section includes optical amplifiers, coherent optics and picosecond pulse systems.