

# ANDREW G HALLAM, PhD, BSc, CPhys, MinstP, MIEEE

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## Brief Synopsis

- Freelance optical fibre technology consultant.
- Design of optical fibre measurement systems.
- Problem solving and customer support.
- Calibration expertise.
- UK delegate on IEC standards committees.

## Example Consultancy Assignments

**Mode controller:** Recent standardisation in Local Area Networks necessitates a means of being able to specify and control the mode distribution in multimode fibre. A novel technology was developed enabling the mode distribution to be adjusted to comply with the standard. This device is now being manufactured by Arden Photonics Ltd. In the course of this work, it was necessary to design and build test equipment. This equipment, for comprehensive Visual Basic control code was written, has also become a commercial product.

**High-resolution interferometry:** A high power Michelson interferometer was required for the inspection of the end-face of cleaved optical fibres. Ray-trace software was used to design an optical system that compensated for aberrations caused by viewing through a beamsplitter cube. This system is now in commercial production.

**Gas turbine engines:** Optical pyrometry may be used to measure the very high blade temperatures inside gas turbine engines. The operating environment of these engines is thermally and mechanically hostile. A project is currently underway to improve the reliability of optical pyrometers and improve quality of the data.

**Mode-field diameter measurement:** The challenge here was to provide a high quality image of the side view of a cleaved fibre end, so that it could be accurately

positioned for measurement of its mode field. A careful balance between optical resolution and the depth of focus had to be made so that the end of the fibre, and also its sides, were simultaneously in focus

**Technology surveys:** Working for a patent attorney, a series of technology and reviews were carried on novel waveguide components for the Photonics industry. This work entailed comprehensive searches of technical journals and patent databases.

**Optical time domain reflectometer:** Working for a major designer of test equipment, the role was to assist in the design of the optics for an OTDR and provide algorithms for data processing. Compliance with international fibre standards was a key part of the project.

**Camera viewfinder optics:** Working for a manufacturer of 'intrinsically safe' test equipment, the requirement was to design an optical viewfinder for a digital camera.

## **Chronological Career Summary**

**1999-present:** Freelance Consultant: Halcyon Optical Services.

**1986-1999:** Measurement Standards Manager: GN Nettest, (formerly York Technology Ltd.).

Responsible for the calibration and traceability of fibre characterisation products. This work included running a calibration laboratory to ISO 9000 standards and the development of new calibration techniques, working closely with NPL in the UK and NIST in the US. I was also a special advisor to the Department of Trade & Industry to assist NPL in setting up a facility to measure the non-linear properties of optical fibres.

**1983-1986:** Project leader: York Technology.

Development of an automated optical fibre cleaving and inspection instrument, and the design and development of a multimode bandwidth measurement system.

**1977-1983:** Senior Scientist: Plessey Research (Caswell) Ltd.

Development of piezo-electric fibre cleaver technology. Research into temperature and strain sensing using optical fibre interferometers. Awarded A. F. Bulgin prize for integrated optics work.

**1974-1977:**

Nottingham University: BSc Honours (upper second ) in Physics.

### **Technical Skills**

- Optical test equipment design.
- Visual Basic programming.
- ZEMAX optical design software.
- WinLens optical design software.
- Calibration and uncertainty estimation.
- MathCad mathematical analysis and modelling.
- Optical fibre standardisation.

### **Publications**

*'Photochromic Stripe Waveguides for integrated optics'*, 1st European Conference on Integrated Optics, London, Sept 1981.

*'Optical Waveguide Components in Organic Photochromic Materials'*, IREE vol 53, no.9, Sept 1983.

*'Development of a Calibration Standard for Fiber Geometry Measurements'*, Symposium on Optical Fibre Measurements, Boulder, CO. USA, Sept 1988.

*'Towards a Calibration Standard for Fiber Geometry Measurement'*, Conference on Optical Fiber Communication, OFC 90, San Francisco, USA, Jan 1990.

*'Calibration of Fiber Diameter Measurements'*, Symposium on Optical Fiber Measurements, Boulder, Co. USA, Sept 1990.

*'Fiber Diameter Measurements and their Calibration'*, Journal of Lightwave Technology, vol 8, no. 9, Sept 1990.

*'Measurements on the Uniformity of Fibre Cladding Diameter'*, Optical Fibre Measurement Conference, York, UK, Sept 1991.

*'COST 217 intercomparison and analysis of fibre mode-field diameter measurements'*, IEE Proc-J, vol 138, No.6, Dec. 1991.

*'A Re-Formulation of the Expression for Mode-Field Diameter in the Variable Aperture Domain'*, Photonics Technology Letters, vol 6. no. 2, February 1994.

*'Measurement and Calibration of Fiber Coating Geometry by Grey-Scale Analysis'*, Journal of Lightwave Technology, vol 13, no. 8, Aug 1995.

*'A comparison of three techniques for effective area measurement of single-mode optical fibres'*, Symposium on Optical Fibre Measurements, Boulder, CO. USA, Sept 2000.

*'Accuracy of MFD and  $A_{eff}$  Measurements Using Far-Field Scanning Technology'*, Symposium on Optical Fibre Measurements, Boulder, CO. USA, Sept 2002.

*'A Bi-Directional Optical Time Domain Reflectometry Technique Optimised for Short LAN Fibers'*, Symposium on Optical Fibre Measurements, Boulder, CO. USA, Sept 2004.

*'Mode Control in Multimode Optical Fibre and its Applications'*, PhD thesis, Aston University, Oct 2007.

*'Mode Control for Emerging Link Performance Standards'*, IET Optoelectronics, vol 2, no.5, pp.175-181, 2008.

## **Patents**

*'APPARATUS FOR DETERMINING THE INDEX PROFILE OF AN OPTICAL FIBRE'*  
- EP0277838.

*'MEASURING GEOMETRY OF OPTICAL FIBRE COATINGS WITH TRANSVERSE INCIDENT BEAMS'* - US5335057.

*'DEVICE FOR CONTROLLING THE MODE DISTRIBUTION IN MULTIMODE OPTICAL FIBRE'* – GB2405488.

*'DEVICE FOR PRODUCING A STABLE MODE DISTRIBUTION IN MULTIMODE OPTICAL FIBRE'* – GB0903643.5.

## **International Standards**

FOTP-55: *'End-View Methods for Measuring Coating Geometry of Optical Fibers'*, TIA/EIA-455-55C.

FOTP-119: *'Coating Geometry Measurement for Optical Fiber by Gray-Scale Analysis'*, TIA/EIA-455-119.

FOTP-133: *'Length Measurement of an Optical Fiber or Cable by the Phase-Shift Method'*, TIA/EIA-455-133.

IEC61745: *'Calibration of Optical Fibre Geometry Test Sets'*.

IEC61300-3-43: *'Examinations and measurements - Mode transfer function measurement for fibre optic sources'*.