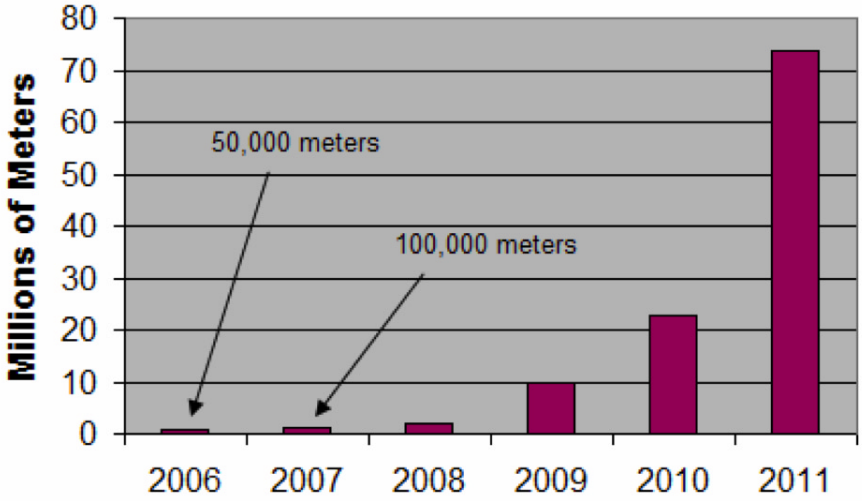
POF•Newsletter

Newsletter Covering Worldwide Developments in the Technology, Market, and Application of Plastic Optical Fiber

Vol. 16 No. 3 **June/July 2007**

Projected usage of 3mm diameter PMMA fiber for hybrid solar lighting (HSL)



Source:Sunlight Direct,POFWORLD West 2007 proceedings

UPCOMING POFTO EVENTS

POFTO is planning its tradeshow events for 2007/2008. POFTO members can exhibit at these events at a low cost compared to the costs to companies going it alone. POFTO member companies interested in participating should contact Paul Polishuk at POFTO Headquarters, c/o IGI.

The 16th International Conference on Plastic Optical Fibers (ICPOF 2007)

- September 10-12, 2007, Turin, Italy

In This Issue...

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Official Publication of the

POF Plastic Optical Fiber Interest Group

SPIE Optics East 2007 Exhibition
- September 11-12, 2007, Seaport World Trade Center, Boston, MA, United States

POF Day @ ECOC
- September 17, 2007, Berlin, Germany

POFWORLD EAST 2007
- (Details to be announced soon)

OFC/NFOEC 2008
- February 24-28, 2008 (POF Day is Feb 26), San Diego, CA , United States

SAE 2008 (POF Session on Automotive Applications)
- April 14-17, 2008, Cobo Hall, Detroit, MI, United States

The 17th International Conference on Plastic Optical Fibers (POF 2008)
- September 15-17, 2008, Las Vegas, Nevada, United States

Sensors 2008
- June 9-11, 2008, Donald E. Stephen Convention Center, Rosemont, Il

CEDIA 2008
- Sept 3-7, 2008, Denver Convention Center, Denver, Colorado

ICPOF 2007 Conference Program

The 16th POF conference will be held in Turin, Italy, September 10-12 at the Le Mèridien hotel. The conference is being organized by the Istituto Superiore Mario Boella (ISMB). For conference details, visit www.pofconference2007.com.

Monday 10th September

10.00-12.00 — Room A — Opening Speeches

Yasuhiro Koike, Keio University
David Cunningham, AVAGO Technologies
Roberto Saracco, Telecom Italia

14.00-16.00 — Room A — SENSORS-I

SEN-I-1 Zang, Webb, Kalli, Emiliyanov, Bang, Kjaer (Aston University, Higher Technical Institute Nicosia, Technical University of Denmark)
Bragg grating inscription in TOPAS microstructured polymer optical fiber

SEN-I-2 Khotiaintsev, Arrue, Svyryd, Zubia (National Autonomous University of Mexico, University of the Basque Country)
Numerical modeling of polymer optical fiber refractometric sensors with hemispherical detection elements

SEN-I-3 Hambley, Canning (University of Sidney)
Ultra-fast tapering of polymer fibers for sensing applications

SEN-I-4 Vaughan, Woodyatt, Scully (The University of Manchester)
Polymer optical fiber sensor to monitor skin moisture and perspiration

SEN-I-5 Lenke, Krebber, Wingand, Thiele (BAM, Saxon Textile Research Institute)
Distributed strain measurement with polymer optical fiber integrated in technical textiles using the optical time domain reflectometry technique

SEN-I-6 Werneck, Yugue, Maciel, Silva-Neto, Carvalho, Miguel, Ribeiro (Universidade Federal do Rio de Janeiro)
Application of a POF and ruby florescence based temperature system in an electric power substation

SEN-I-7 Poisel, Luber, Loquai, Neuener, Bachmann (POF-AC)
POF strain sensor using phase measurement techniques

16.30-18.30 — Room A — DATACOM-I

DAT-I-1 Hung, McGarvey, Duggan, Barrow, Calvert, Lambkin, Wipiejewski (Firecomms Ltd)
Red VCSEL transceivers for Gigabit data transmission over plastic optical fiber

DAT-I-2 Lee, Randel, Vinogradov, Ziemann, Offenbeck, Koonen (Eindhoven University of Technology, Siemens AG, POF-AC, Fraunhofer Institute for Integrated Circuits)
10Gbps over large diameter polymer optical fibers

DAT-I-3 Hirscher (Reichle&DeMassari)
Triple-play realization of Swisscom with POF

DAT-I-4 Gaudino (Istituto Superiore Mario Boella, Politecnico di Torino)
Invited paper: The POF-ALL European project

DAT-I-5 Offenbeck, Weber, Vinogradov (Fraunhofer Institute for Integrated Circuits IIS, POF-AC)
Analog GHz transmission over large core fibers for DVB satellite links of sophisticated coding schemes

DAT-I-6 Koonen, Larrodè, Ng'oma, Yang, Van den Boom (Eindhoven University of Technology)
In-house broadband wireless service delivery using Radio over Multi-mode Fiber

DAT-I-7 Breyer, Lee, Randel, Hanik (Technische Universitat Munchen, Eindhoven University of Technology, Siemens AG)
10Gbps transmission over 220 m perfluorinated graded-index polymer optical fiber using PAM-4 modulation and simple equalization schemes

Tuesday 11th September

9.00-10.30 — Room A — COMPONENTS-I

COM-I-1 Sklarek, Danielzik, Vinogradov, Ziemann, Lednicky, Offenbeck, Kragl (Schott AG Mainz, POF-AC, Fraunhofer Institute for Integrated Circuits Erlangen, DieMount GmbH)
The influence of photo diode diameter on maximum data rate and sensitivity of POF systems

COM-I-2 Swoboda, Fortsch, Leeb, Zimmermann (A3PICS Electronics Development GmbH, Vienna University of Technology)
A highly sensitive 1.25Gbps POF receiver

COM-I-3 Offenbeck, Weber (Fraunhofer Institute for Integrated Circuits IIS)
Versatile alterable Gigabit transceiver for large core fibers ready for mass production

COM-I-4 Moellers, Gindera, Bulters, Hung, Jager (Universitat Duisburg-Essen)
High-speed transceiver for Radio-Over-POF applications

COM-I-5 Cox, Large (University of Sidney)
Microstructured polymer optical fiber for chemical and biochemical sensing

COM-I-6 Uehara, Kondo, Takahashi, Koike (Keio University, ERATO-SORST)
High-efficiency optical concentrator for a plastic optical fiber communication

Room B — FIBERS-I

FIB-I-1 Wang, Kang, Yang, Chen (Chinese Academy of Science)
Progress in extrusion technology of big-size holey POF preforms

FIB-I-2 Xue, Barton, Large (University of Sidney)
Inverse prediction of die shape in the direct extrusion of preforms for microstructured optical fibers

FIB-I-3 Argyros, Pla (University of Sidney)
Hollow-core polymer fibers with a kagome lattice cladding.

FIB-I-4 Kurashima, Watanabe, Murofushi (Asahi Glass Company)
Development of perfluorinated GI-POF with double cladding layer

FIB-I-5 Poulin, Argyros, Large, Kashyap (University of Sidney, Ecole Polytechnique de Montreal)
Fabrication and characterisation of a large-core bridged air-clad high numerical aperture microstructured polymer optical fiber

FIB-I-6 Furukawa, Tagaya, Iwata, Koike (Keio University, Japan Science and Technology Agengy)
Design of a polarization maintaining graded index plastic optical fiber by random co-polymerization

11.00-12.30 — Room A — POSTERS

POS-1 Zirkelbach, Bachmann, Ziemann (POF-AC)
Mechanical properties of POF at different temperatures

POS-2 Poisel, Pai-Soler, Ziemann (POF-AC)
Design and properties of POF star couplers

POS-3 Bobitski, Yaremchuk, Bartkiv, Poisel (Lviv Polytechnic National University, University of Rzeszow, POF-AC)
Design and optimization of thin-film filters for WDM demultiplexers for POF systems

POS-4 Takenaka, Namikawa, Mawatari, Yamazaki, Sato, Tabata, Imai (Mururoan Institute of Technology)
Mechanism of fiber Bragg grating formed in polymer optical fiber with some additives

POS-5 Haupt, Fischer (Harz University of Applied Sciences)
Computer-aided simulation of a demux/mux-element for POF in the visible spectrum

POS-6 Zeng, Yang, Van den Boom, Koonen (Eindhoven University of Technology)
5-Subcarrier multiplexed 16-QAM transmission over a 50 m-core-diameter graded index perfluorinated polymer multi-mode fiber

POS-7 Ribeiro, da Silva, Barbero (Universidade Federal Fluminense)
Spectral filtering effect on visible wavelength channels propagating along PMMA-based plastic optical fiber links

POS-8 Emiliyanov, Bang, Hoiby, Pedersen, Kjaer, Lindvold (Tecnhical University of Eindhoven, Technical University of Denmark)
Multi-antibody biosensing with TOPAS microstructured polymer optical fiber

POS-9 Arcos, Chana, Contreras, Coello, Baldwin, Rueda, Lomer (Pontificia Universidad Catolica del Perù, University of Cantabria)
Design and fabrication of a novel plastic optical sensor for temperature measurements using a chemical transducer

POS-10 Rodriguez, Diaz, de la Mora, Romo-Medrano (Tecnologico de Monterrey Campus Ciudad de México)
Low-cost gasoline/ethanol plastic optic fiber sensor

POS-11 Silva, Werneck, Yugue, Maciel, Beres, Correa, Carvalho, Silva-Neto, Miguel (Universidade Federal do Rio de Janeiro)
POF tapering for evanescent field sensors

POS-12 Beres, Correa, Silva, Miguel, Werneck, Yugue, Maciel, Carvalho, Silva-Neto (Universidade Federal do Rio de Janeiro)
Use of a biosensor based on plastic optic fiber for the evaluation of the microbiological quality of the milk

POS-13 Poisel, Meedt, Luber, Niewisch (POF-AC)
Fiberoptic Liquid Level Sensor-FOLLS

POS-14 Poisel, Weigert, Babchenko (POF-AC)
Imperfected POF for bending sensors

POS-15 Poisel, Gabel, Schutz, Kist, Bachmann, Bloos (POF-AC)
Daylighting with POF

POS-16 Ribeiro, da Silva, Germano, Barbero (Universidade Federal Fluminense)
Beam profiling measurements of light fields emanating from plastic optical fibers and passive devices

POS-17 Founaud, Mateo, Losada (Universidad de Zaragoza)
Prospective study of the alternatives for triple-play networks into the home

14.00-16.00 — Room B — SENSORS-II

SEN-II-1 Konstantaki, Franghiadakis, Mavromataksz, Zacharopoulos, Kalymnios, Koudoumas (Foundation for Research and Technology Heraklion, Technological Educational Institute Heraklion, London Metropolitan University)
The effect of concentrated sunlight transfer of the transmission characteristics of plastic optical fibers

SEN-II-2 Vàzquez, Nombela, de Vega, Sobrino, Montero (Carlos III University of Madrid)
Plastic fiber-optic probes for characterizing fluidized beds in bubbling regime

SEN-II-3 Ribeiro, Xavier, Mitrione, Barbero (Universidade Federal Fluminense)
Optoelectronic rectenna for RF electromagnetic sensing linked to remote site using plastic optical fiber

SEN-II-4 Witt, Bunge, Shukar, Schluter, Krebber (Federal Institute for Material Research and Testing, Technical University Berlin)
Real-time strain sensing based on POF OTDR

SEN-II-5 Yang, Wang, Kang, Yang (Chinese Academy of Science)
Nanosilver modified polymer crystal optical fibers for electroanalysis and fluorescence detection

SEN-II-6 Carroll, Webb, Kalli, Zang, Argyros, Large (Aston University, Higher Technical Institute Nicosia, University of Sidney)
Extending the working temperature range of Bragg gratings in microstructured polymer optical fiber by annealing

SEN-II-7 Scully, Spagni (The University of Manchester)
Sensing and measurement in hydrogen and fuel cells stationary applications

16.30-18.00 — Room A — COMPONENTS-II

COM-II-1 Camatel, Nespola, Càdrenas, Abrate, Gaudino (Istituto Superiore Mario Boella, Politecnico di Torino)
LED non-linearity characterization and compensation

COM-II-2 Lomer, Contreras, Rueda, Quintela, Arrue, Zubia, Lòpez-Higuera (University of Cantabria, Pontificia Universidad Catolica del Perù, University of the Basque Country)
Optical fiber coupler-switch controlled in temperature

COM-II-3 Taniguchi, Kawakami, Sueyoshi (Sekisui Chemical Co. LTD)
The ultimate easy-connection and its experiment results with GI-POF

COM-II-4 Lallana, Vàzquez, Montero, Heggarty, Vinouze (Carlos III University of Madrid, Ecole Nationale SUperieure des Telecommunications de Bretagne)
Dual 3x1 multiplexer for POF networks

COM-II-5 Namikawa, Takenaka, Mawatari, Sato, Yamazaki, Tabata, Imai (Mururoan Institute of Technology)
Bragg gratings formation at a visible region of polymer optical fibers

Room B — SENSORS-III

SEN-III-1 Oyadiji, Sun (University of Manchester)
Performance of light intensity-based plastic optical fiber strain sensors

SEN-III-2 Krebber, Grillet, Witt, Schukar, Kinet, Thiel, Pirotte, Deprè (BAM, Multitel, Advanced Optics Solutions GmbH, Centexbel, Elasta)
Invited paper: Optical fiber sensors embedded into technical textile for healthcare (OFSETH)

SEN-III-3 Olivero, Perrone, Vallan, Abrate, Cacciatore, Perale, Perale (Politecnico di Torino, Istituto Superiore Mario Boella, Politecnico di Milano, Impresa di Costruzioni Ing. Antonio Perale)
Plastic optical fiber based sensing system for crack monitoring

SEN-III-4 Arrue, Jimenez, Durana, Alabaldetreku, Zubia, Lomer (University of the Basque Country, University of Cantabria)
Analysis of the parameters of tapers in graded-index POFs for the design of a refractive-index sensor

SEN-III-5 Correia, Beres, Silva, Miguel, Werneck, Yugue, Maciel, Carvalho, Silva-Neto (Universidade Federal do Rio de Janeiro)
Detection of Escherichia coli in water using plastic fiber-optic biosensor

Wednesday 12th September

9.00-10.30 — Room A — DATACOM-II

DAT-II-1 Evano, Bouffant, Mercier, Francois, Goudeau (France Telecom, Nexans)
PF GI-POF: a very attractive solution for home networking

DAT-II-2 Ziemann, Vinogradov, Zimmermann, Fortsch, Swoboda, Offenbeck (POF-AC, Vienna University of Technology, A3PICs Electronics Development GmbH, Fraunhofer Institute for Integrated Circuits IIS)
Messively parallel transmission over polymer optical fiber for backplane applications and interconnects

DAT-II-3 Vinogradov, Junger, Offenbeck, Weber, Weickert, Bauernshmitt, Ziemann, Hartl (POF-AC, Fraunyhoger Institute for Integrated Circuits IIS, Loewe Opta GmbH, SGT Spritzgietechnik)
HDTV data transmission over POF ribbon cables

DAT-II-4 Yang, Van den Boom, Koonen (Eindhoven University of Technology)
Wavelength multiplexed quadrature amplitude modulation for low cost high capacity data transmission over plastic optical fiber

DAT-II-5 Randel, Lee, Breyer (Siemens AG, Eindhoven University of Technology, Technische Universitat Munchen)
1Gbps transmission over POF using light-emitting diodes

DAT-II-6 Nespola, Camatel, Abrate, Càrdenas, Gaudino (Istituto Superiore Mario Boella, Politecnico di Torino)
Fast-Ethernet transmission over extended reach SI-POF links

Room B — FIBERS-II

FIB-II-1 Yu, Argyros, Barton, Van Eikelenborg, Barbe, Finnie, Kong, Ladouceur, McNiven (University of Sidney, Australian Nuclear Science and Technology Organization, University of New South Wales)
Universal dopant delivery method for polymer optical fiber

FIB-II-2 Kruglov, Shbelgut, Zadorin, Poisel, Chernov (Tomsk State University, POF-AC)
Calculation of the waveguide mode profile in the microstructured fibers on the basis of stratification method

FIB-II-3 Kondo, Noguchi, Miyamoto, Takahashi, Koike (ERATO-SORST, Keio University, Scalar Corporation)
High numerical aperture graded index polymer optical fiber

FIB-II-4 Kang, Wang, Yang, Chen, Li (Chinese Academy of Science)
Fabrication of hollow-core photonics band-gap microstructured polymer optical fiber by extrusion

FIB-II-5 Bunge, Poisel (POF-AC)
Report on the POF modelling workshop 2007 in Nuernberg

FIB-II-6 Plochberger, Chow, Large (University of Sidney, POF-AC)
End-face preparation of microstructured polymer optical fibers

11.00-12.30 — Room A — DATACOM-III

DAT-III-1 Terada, Tojo, Taniguchi, Kawakami, Oguchi (Seikei University, Sekisui Chemical Co. LTD)
Next-generation home network and its applications

DAT-III-2 Bergaglio, Gnazzo, Gregori, Marranzino, Palma (Telecom Italia)
POF use for IPTV in home distribution

DAT-III-3 Kawakami, Sueyoshi, Taniguchi (Sekisui Chemical Co. LTD)
Requirements and wiring methods for POF in existing houses, and its experimental results

DAT-III-4 Kragl, Bluschke, Ziemann (DieMount GmbH, Teleconnect GmbH, POF-AC)
POF data link applications in the field of local access networks

DAT-III-5 Gaudino, Bosco, Bluschke, Hofmann, Kiss, Rietzsch, Randel, Lee, Breyer (Istituto Superiore Mario Boella, Politecnico di Torino, Teleconnect GmbH, Siemens AG, Eindhoven University of Technology, Teshnische Universitat Munchen)
On the ultimate capacity of SI-POF links and the use of OFDM: recent results from the POF-ALL project

14.00-16.00 — Room A — STANDARDS

STD-1 Harris, Ferguson (National Physical Laboratory Middlesex)
Development of an optical launch system for polymer optical fiber and its application to spectral attenuation and bandwidth measurements

STD-2 Wandschneider, Dietz, Eckhardt, Klein, Hillrichs (University of Applied Sciences Merseburg, University of Applied Sciences Giessen-Friedberg)
Transmission properties of POFs for pulsed UV laser light

STD-3 Schramm (BMW Group)
Invited paper: Sheer driving pleasure with POF

STD-4 Losada, Mateo, Serena (Universidad de Zaragoza,)
Analysis of propagation properties of step index plastic optical fibers at non-stationary conditions

STD-5 Durana, Aldabaldetreku, Zubia, Arrue, Jiménez (University of the Basque Country)
Numerical measurement of coupling losses in perfluorinated multi-core polymer optical fibers

STD-6 Heredia, Mateo, Losada (Universidad de Zaragoza)
Transmission capabilities of large core GI-POF based on BER measurements

Room B — MATERIALS

MAT-1 Harbach, Limberger, Salathé (Advanced Photonics Laboratory)
UV induced fiber Bragg gratings (FBG) written in fully polymerized polymer optical fibers (POF)

MAT-2 Koike, Teng, Okamoto, Koike (ERATO-SORST, Keio University)
Design of low-loss photonics polymer and its application to GI POF

MAT-3 Asai, Koike (Keio University)
Control of refractive index distribution for high-bandwidth graded index plastic optical fiber by dopant diffusion co-extrusion process.

MAT-4 Baum, Scully (University of Manchester)
Photomodification of polymethyl methacrylate for structuring polymer optical fiber

MAT-5 Rodrigues, André (Universidade de Aveiro)
Rayleigh backscattering constrains on POF bidirectional links

MAT-6 Bazzana, Lanzani, Xia, Morgado, Schrader, Lidzey (Luceat S.p.A., Politecnico di Milano, Imperial College London, Istituto Superior Tecnico Lisboa, University of Applied Science Wildau, The University of Sheffield)
Plastic optical fibers with embedded organic materials for ultra-fast switching

MAT-7 Ribeiro, da Silva, Barbero (Universidade Federal Fluminense)
Material dispersion effects on PMMA-based plastic optical fiber high capacity links

POF Day @ ECOC

POF Day @ ECOC will review recent developments in POF technology and applications by European and US organizations and will be held on the ECOC exhibit floor on September 17. POF Day @ ECOC is jointly organized by POF-AC of the University of Nuremberg; the Information Technology Society Sub Committee 5.4.1, Polymer Optical Fibers; and the Plastic Optical

Fiber Trade Organization (POFTO).

POF Day @ ECOC will include the following presentations.

Morning Session, Scientific Presentations

Chairman: Prof. Dr.-Ing. Olaf Ziemann, Scientific Director of the POF-AC Nürnberg

20 min presentation / 10 min discussion

10:00 Mickael Marie (representing the joint activities of Avago/Infineon), "**Avago Solutions for POF Industrial and Home Networking Applications**"

10:30 Norbert Weber, Bernd Offenbeck, Olaf Ziemann, Juri Vinogradov: "**Universal Low-Cost Gigabit POF Transceiver in Small Form Factor Style**"

11:00 Vincent W. Hung, Brian McGarvey, Geoffrey Duggan, Dave Barrow, Timothy Calvert, John D. Lambkin and Torsten Wipiejewski (Firecomms): "**Red VCSEL Transceivers for Gigabit Data Transmission over Plastic Optical Fibre**"

11:30 Post Deadline Presentations

12:00 Lunch Break, Visit of the POF-Pavilion

Afternoon Session, POF Product Presentations

Chairman: Dr. Paul Polishuk, Plastic Optical Fiber Trade Organization

10 min presentation / 5 min discussion

14:00 Stephan Mannshard (Luceo Berlin): "**10Gbps Bit error rate tester**"

14:15 Jürgen Leeb (A≥PICs Electronics Development GmbH): "**1.25 Gb/s-3.3 V-Receiver-OEIC**"

14:30 Ulrich Fischer-Hirchert (Univ. of Applied Sciences Harz): "**POF-WDM-Systems**"

14:45 Paul Polishuk (POFTO), "**POF Market Trends**"

15:00 Paul Mulligan (FiberFin): "**POF Connectors — A Review of what's Available**"

15:15 Jürgen Nehler, Olaf Meckel, Thomas Wagner (Euromicron): "**EM-RJ — the new connection system for POF**"

15:30 Masatake Kondo (Mitsubishi Rayon): "**Status of POF developments from Mitsubishi Rayon - Important POF quality criteria for data cabling**"

15:45 Josef Faller (Homefibre): "**Experience of POF Home Network Pilot Projects - New product developments**"

16:00 John Lambkin (Firecomms): "**POF Transceiver Solutions for IPTV and Home Networks**"

16:15 Alessandro Nocivelli (Luceat): "**Ethernet over POF - Switch Solution**"

16:30 End of the meeting

POF Symposium at ECOC

The scientific program of ECOC will also include a POF Symposium on September 18 presenting invited talks of worldwide POF experts. More information can be found on the ECOC program website at http://www.ecocexhibition.com.

Polymer Optical Fibers — Effective Solutions for Automotive, Sensors, Home Networking and Interconnection

September 18, 14:00-18:00

Chairman: Olaf Ziemann, POF-AC Nürnberg, Germany

Co-chair: Yasuhiro Koike, Keio University, Japan

Polymer Optical Fibers (POF) have been in wide use for automotive networks (like MOST in 40 different cars) and automation for a number of years now. New applications will be the use of POF in home networks, interconnection, and sensors.

The driving force for POF use in home networks is the continuous increase in the access network capacity. New technologies and applications like VDSL, FTTH, and IPTV require low-cost networks with simple installation, high security, and low space consumption.

The POF Symposium on the ECOC'2007 will show the newest developments in polymer fiber technology, as well as in transmission technology. Some examples are the transmission of 1Gbps over 100m of SI-POF (Siemens) and 30Gbps over GI-POF (Georgia Institute of Technology). Results of the European POF-ALL project will be presented. Invited speakers from Asia, Australia, and North and South America will show the status of POF sensors and the capabilities of mirctrostructured POF.

Program:

The Status of POF Technology

Asuhiro Koike, Keio University/JST ERATO-SORST Koike Photonics Polymer Project, Japan

Plastic optical fibers (POFs) have been established in unique datacom markets such as digital audio interfaces, factory automations, and automotive LANs. Low-loss graded index POF has opened a new market of customer premises networks in recent years. The status of POF technology is reviewed, and the concept of "Fiber-to-the-Display" for broadband society is proposed.

POF Sensors — Applications in every Day's Life

Hans Poisel[1], Demetri Kalymnios[2], Marcelo Martins Werneck[3], Katarina Krebber[4], Joseba A. Zubia[5], Patricia Scully[6]

[1]Polymer Optical Fiber Application Center Nuremberg, Germany, [2]London Metropolitan University, UK, [3]Universidade Federal do Rio de Janeiro, Brazil, [4]Federal Institute for Material Research and Testing Berlin, Germany, [5]University of the Basque Country Bilbao, Spain, [6]University of Manchester, United Kingdom

Fiber-optic sensors are often regarded as being very sophisticated. But this is the same story as with optical communication: We have powerful transmission systems allowing Tbps on one hand side, and we have the mass market, e.g. in automotive or home network applications, on the other hand. The same holds for fiber-optic sensors.

In this paper we will show some representative examples that demonstrate the capabilities of sensors based on polymer optical fibers and their real applications.

Experimental Studies of Bandwidth Behaviour in Graded Index Microstructured Polymer Optical Fibers

Maryanne Large[1], Richard Lwin[1], S. Manos[1], L. Poladian[1], G. Barton[1], L. Harvey[2], D. Hirst[2], J. Harvey[2], Alexander Bachmann[3], Hans Poisel[3], Karl-Friedrich Klein[4]

[1]University of Sydney, Australia, [2]University of Auckland, New Zealand, [3]Polymer Optical Fiber Application Center Nuremberg, Germany, [4]University of Applied Sciences Giessen-Friedberg, Germany

GImPOF (Graded index microstructured polymer optical fibers) differ from conventional GI-POF not just in having a microstructure, but also in having a much larger index contrast. Previous theoretical results had suggested that their behavior may be very different from conventional GI-POF structures. In this talk, the most comprehensive set of experimental data to

date, characterizing the bandwidth, differential mode delay, and equilibrium length, will be presented. The role of chromatic dispersion and experimental error will be explicitly considered. Finally, the results will be compared to those of competing multimode fibers.

Advanced Modulation Techniques for Polymer Optical Fiber Transmission

Sebastian Randel[1], Jeffrey Lee[2], Florian Breyer[3], Ton Koonen[2], Maria Garcia Larrode[2], Jia Yang[2], Anthony Ng'oma[2], Gert-Jan Rijckenberg[2], Henrie van den Boom[2]

[1]Siemens AG Munich, Germany, [2]TU Eindhoven, The Netherlands, [3]TU Munich, Germany

Today, polymer optical fibers (POF) are used in a bunch of applications such as multimedia communications in automobiles and industrial automation. Recently, they also entered the market for home networking. In this scenario, next-generation systems are commonly foreseen to consist of Gigabit wireless technologies with small cell size complemented by a wired in-house backbone that feeds small-scale antennas, e.g., in each room. POF has turned out to be a highly attractive candidate for this purpose as it offers unique features like an outer diameter of only about 1.5mm and self-installation by the end-user, as well as EMI immunity. This talk provides an overview on recent progress in advanced modulation techniques for enabling both Gigabit Ethernet transmission over POF and high-capacity radio-over-POF at high microwave frequencies.

Status and recent Results from the POF-ALL EU Project: Large-core Plastic Fibers for Low Cost, High-speed Short Reach Applications

Roberto Gaudino[1], Alessandro Nocivelli[2], Hans Kragl[3], Olaf Ziemann[4], Norbert Weber[5], Dieter Jaeger[6], Ton Koonen[7], Carlo Lezzi[8], Andreas Bluschke[9], Sebastian Randel[10]

[1]Istituto Superiore "Mario Boella," [2]Torino, Italy, Luceat, Brecia, Italy, [3]DieMount GmbH, Wenigerode, Germany, [4]Polymer Optical Fiber Application Center Nuremberg, Germany, [5]Fraunhofer Institute for Integrated Circuirts Erlangen, Germany, [6]University Duisburg-Essen, Germany, [7]Technical University Eindhoven, The Netherlands, [8]Fastweb SpA, Torino, Italy, [9]Teleconnect Dresden, Germany, [10]Siemens Munich, Germany

POF-ALL is a European STREP project, funded within the EU VI Framework Programme, under the IST call "Broadband for all." The project is meant to develop a low-cost solution based on large-core plastic optical fiber (POF) to make the delivery of broadband access to everyone possible. The project focuses on the last part of access networks towards the final user (a segment usually referred to as "edge network") and on in-building and in-house delivery of high-speed digital signals. A careful optimization of the enabling technologies (components, devices, and protocols) will end up in a real-life field test. This paper, besides describing the framework of the project, presents the most recent technical achievements. In particular, we show advanced transmission techniques over 1mm large-core POF that allows us to achieve, using different technical solutions, 100Mbps over 200 meters and 1Gbps over 100 meters.

100Mbps-Gbps-10Gbps and beyond, the Use of POF in Home Networking and Interconnection

Olaf Ziemann[1], Whitney R. White[2]

[1]Polymer Optical Fiber Application Center Nuremberg, Germany, [2]Chromis Fiberoptics, Warren, NJ USA

Fast Ethernet SI-POF systems are on the way to mass production now. Complete installation sets are available by Siemens, for example. But POF technology offers much higher potential.

Data rate of 1Gbps can be realized by the use of PMMA-GI-POF, but also by multicarrier transmission on SI-POF.

Data rates of 10Gbps and more (30Gbps has been demonstrated) can be realized by PF-GI-POF or by parallel transmission over POF ribbons.

The presentation will give an overview of the present available technology, possible applications, and the advantages of POF technology in comparison to glass fibers and copper cables. The biggest application at this time is the use of POF in car networks. Much higher potential will be the use in home networks and in interconnection solutions.

MOST COOPERATION

Plug, Play and Drive Away

By Murray Slovick

Reprinted from CEA's *Vision,* July/August 2007

It's hard to compete with the consumer electronics industry. Just ask automakers. Saddled with a drawing-board-to-dashboard time of three to five years, largely due to vehicle safety and liability issues; reliability requirements for the 15-year service life of the car; and a harsh operating environment, car OEMs trying to appeal to buyers with the latest in-car entertainment options find it impossible to keep pace with CE's breakneck six-to-12 month product upgrade cycle.

If you can't beat them — well, you know the rest. Recognizing that consumers are carrying portable devices into their vehicles expecting to use and access the content in these nomadic units with the same functionality and entertainment experience they get at home, car makers are turning to plug-and-play solutions using existing connections in the car.

To facilitate compatibility between carry-in devices and the vehicle's entertainment system, CEA's R6 Mobile Electronics Committee is extending a standard currently under development (CEA-2017.1) to allow connection of MP3 players and other portable units to the auto industry's MOST (Media Oriented System Transport) data network. A previously adopted CEA Standard, CEA-2012, defined features needed to enable an aftermarket MOST network to communicate with mobile electronics products, permitting those products to be easily installed and operated.

MOST is designed to be a common data and content pipeline across competing auto brands. Once a MOST connection is established, data flows continuously and no further processing of digital packet information is needed. At the moment, approximately 45 models are available with the MOST network installed. While the majority of these are European brands (e.g., BMW, Mercedes-Benz, and Volvo), Asia-based Hyundai and Toyota also are supporting the network standard. A byproduct benefit for automakers employing MOST is a reduction in cost and complexity: electrical harness design and packaging are simplified because MOST reduces the number of wires and connections required.

MOST comes in several flavors.

MOST25 and MOST50 operate at 25Mbps and 50Mbps, respectively. The next generation of MOST will be capable of as many as 150Mbps, making it more appropriate for sending video around the car.

While CEA and the auto industry work to connect MOST and CE devices, an interim plug-and-play solution to enable audio and video streaming from portable units in the car is to employ wired USB and/or wireless protocols such as Bluetooth. Again, there is a side benefit for automakers

in taking this approach as they transfer digital rights management (DRM) responsibility to the end customer by letting the consumer's own device decrypt and deliver the digital content.

Due to USB's widespread acceptance in the consumer market — it has become the de facto industry standard for connecting peripherals to PCs and mobile phones and MP3 players to laptops — it seems the obvious choice for a quick adaptation in automotive applications. As an example, consider Alpine's iDA-X001 digital media head unit, designed to deliver a fully integrated iPod experience in the car using USB and iPod dock connections. As a "Made for iPod " program member, Alpine used the iDA-X001's USB connection to allow consumers to naturally and easily navigate through all of the digital content on their iPod via the head unit. As a result, the iDAX001 captured both the 2007 CES Innovations Award in the Mobile Audio category and the 2007 iLounge.com "Best of Show" Award at Apple's Macworld.

This same shift toward plug-and-play flexibility also will fuel greater demand for wireless technologies in the car, particularly Bluetooth. Here's a number for you: Bluetooth technology is shipping today at a rate of more than 12 million devices per week. Here's another number: Bluetooth has an installed base of more than 1 billion devices (both stats according to the Bluetooth Special Interest Group). In March, the Bluetooth SIG announced that the core specification for Bluetooth version 2.1 +EDR (Enhanced Data Rate)soon will be made available with a couple of new features: improved pairing (making the initial connection between devices easier by reducing the number of steps needed) and lower power consumption to increase battery life.

Demonstrating that Bluetooth connectivity is no longer restricted to mobile phones or high-end car stereo, Sony, to cite one example, took the wraps off of a low-cost (about $180) Bluetooth CD receiver at its product line show. Sony's MEX-BT2500 can stream music from a Bluetooth cellphone and provide hands-free calling through the radio. It works with as many as five phones and displays album, artist, and track information on the radio display. It delivers 52 watts x 4 output, has a removable faceplate with a front-panel auxiliary input, and is MP3 and WMA ready.

From USB connections to Bluetooth to the MOST system, automakers quickly are learning how to join CE manufacturers in bringing the latest technology to drivers.

Also important for the CE industry is that automakers are making more plug-and-play opportunities available, thus making it easier to install the latest technology in vehicles and encouraging market growth for thousands of mobile electronics certified installers (www.MECP.com).

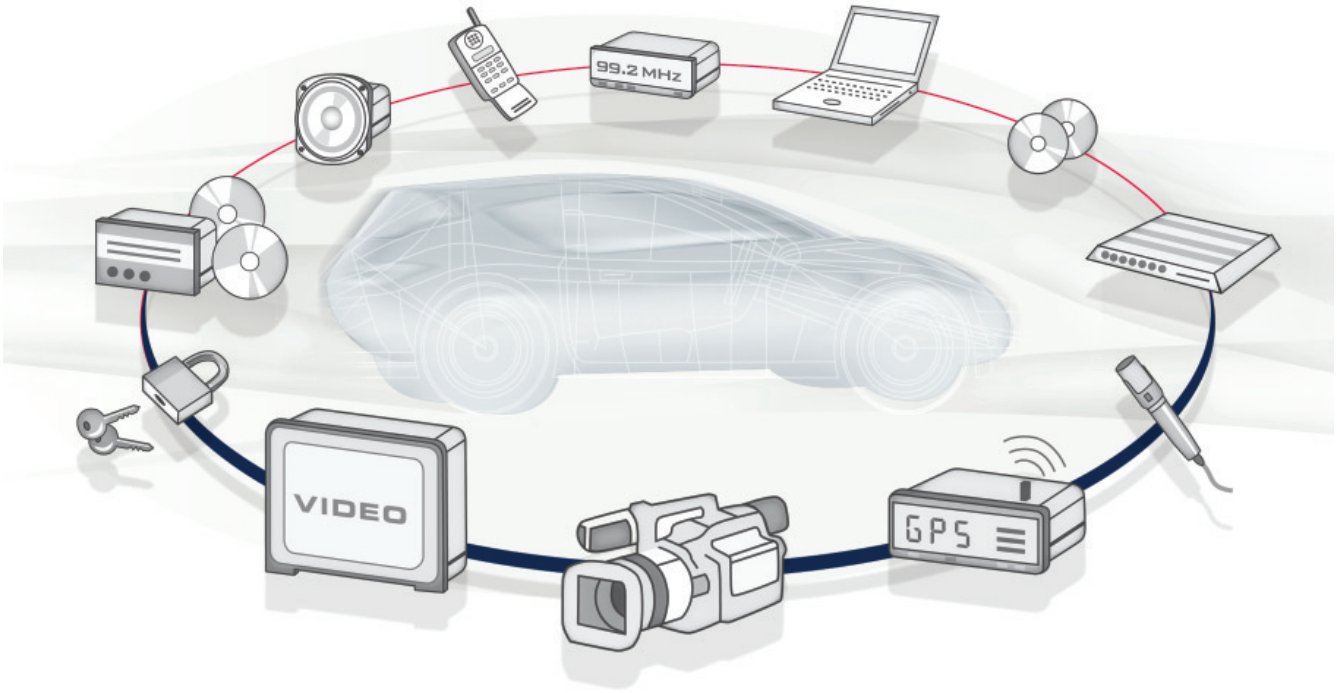
MOST Cooperation presents success story

The MOST Cooperation, the organization through which the automotive multimedia network Media Oriented Systems Transport (MOST) is standardized, will be showing its latest achievements and roadmap at the 13th International Conference "Electronics in Vehicles" on October 10 and 11, 2007, in Baden-Baden, Germany. These achievements include advances in robustness and quality, through a compliance verification process; significant cost reductions since the technologies' introduction; and technical achievements with faster data rates, new physical layers, and enhanced video distribution. The MOST Cooperation will also show where it is heading to by presenting the next generation of MOST, MOST150, with a variety of new features.

MOST technology has now been implemented in over 45 vehicle models from various carmakers. It continues its expansion, with the first Asian vehicle models expected soon. Acceptance has been very fast, with many manufacturers implementing the technology throughout their product lines within two or three vehicle design cycles.

"The Congress is an ideal venue to present to the automotive public the latest designs and developments of the MOST Cooperation and its members," stated Dr. Wolfgang Bott, technical coordinator of the MOST Cooperation. "We will have live demonstrations of MOST networks running at 50Mbps over Unshielded Twisted Pair (UTP) wires and the new MOST 150 speed grade running at 150Mbps over optical fiber. The Cooperation is hard at work to bring out the next-generation MOST Specification that will enable applications such as multiple HD video streams, real-time video, DTCP content protection, and the transparent transport of Ethernet data traffic. Other highlights include an established compliance test process that enhances robustness and quality as it ensures devices adhere to the MOST specifications, and optimizations in the network management and fault diagnosis functions. The demonstrations will be held in booth 25a and in room 2 and will highlight the success of our efforts to reduce cost and increasing quality by concentrating on compliance processes while in parallel advancing the technology to meet the need of tomorrow's infotainment systems."

MOST Multimedia Network for Infotainment Data Transfer in Cars



TECHNOLOGY

1Gbps transmitted on plastic fiber

Matthew Peach, contributing editor, fibers.org

Researchers at Siemens Corporate Technology say they have set a new record for data transmission in optical polymer fiber cables. A new data transmission technique allows the transmission of 1Gbps down a plastic fiber — 10 times more than with other such products

currently available. “This achievement should finally enable polymer fibers to become established in the home entertainment sector and in factory automation,” said Sebastian Randel, project manager at Siemens Corporate Technology.

Polymer fiber cables enable the establishment of high-speed data links even on a home network. Small converter boxes convert the electrical signal from the incoming copper cable into an optical signal. Siemens says that because of the high transmission rate of the polymer fiber cables, even television signals with high data volumes could be transmitted around the home.

Until now, polymer fibers have suffered from the crucial disadvantage that their transmission capacity has typically been limited to 100Mbps. Although that is enough for DSL (broadband) transmission, Internet telephony, and Internet TV, Siemens says that 1Gbps will soon be required due to the rapidly increasing transmission capacity in the Internet. The future for user-friendly, low-cost polymer cables had been looking bleak for a time, added Randel.

The trick that enables optical polymer fiber cables to support Gigabit speeds is that the bits are not sent as usual light pulses as was the case previously. Instead, the Siemens researchers have applied a special algorithm that converts the light signals in such a way that more information fits into the available bandwidth of the polymer fibers.

The researchers have adapted the familiar multicarrier modulation technique used in DSL and WLAN so that it is also applicable to light signals. “Thanks to quadrature amplitude modulation with up to 256 signal states, the so-called bandwidth efficiency measured in bits per second and hertz can be increased significantly,” explained Randel. “With our algorithm, we can transmit exactly 1008 megabits per second through a polymer fiber cable.”

This makes the polymer fiber suitable not only for the future in private homes but also especially for industrial automation applications where the rugged, low-cost cables have long been established as the standard. They are used to connect machine tools or robots together and to link them to the central control unit. In the same way as in the private sector, ever higher data rates are called for in industry, which is also aiming to attain the Gigabit mark.

Randel sees even more potential applications for high-speed polymer fibers, for example in the automotive industry, in the controlling of wind turbines, or particularly in medical technology where data volumes are growing at a rapid pace due to the constant increase in the resolution of imaging processes such as computed tomography. Now nothing stands in the way of a successful future for low-cost polymer fiber cables.

10G over GI-POF

Dr. Ivan Djordjevic, University of Arizona Department of Electrical and Computer Engineering

In our recent article we discussed the possibility of 10Gbps transmission over GI-POF links using coded OFDM. Through the concept of cyclic extension, the overlapping of neighboring OFDM symbols is allowed, and by using a sufficient number of subcarriers, the ISI due to chromatic dispersion can be significantly reduced. A simple equalization technique for chromatic dispersion compensation based on short training sequence is introduced. To improve poor power efficiency of multiple subcarrier systems, we proposed the use of single-sideband (SSB) transmission and clipped- and unclipped-OFDM. Due to severe dispersion distortion of signals at 2.5Gbps and above transmitted over GI-POFs, a power forward FEC schemes, much more powerful than those already proposed for use in long-haul transmission, are needed. Several such FEC schemes based on girth-8 low-density parity-check (LDPC) codes were introduced as well. Another possible alternative is to use turbo product codes. The coded OFDM is applicable in any POF system, as long as the transfer function of fiber is known, which can be obtained by measurements.

NEW PRODUCTS

New Molex SMI interconnects provide space saving solutions for compact consumer devices

New compact designs in consumer electronics have increased the demand for smaller interconnect solutions. To meet this need, Molex Incorporated announced a new plastic optical fiber data link solution. Based on the Molex small media interconnect "SMI," this solution offers seamless, low-cost optical data link solutions, as well as space-saving qualities through its reduced size and added surface mount capabilities.

As a complete duplex POF solution, the Molex SMI connector and transceiver interconnect system has been adopted by the IEEE 1394 trade committee and is now gaining momentum as the industry standard for POF interconnects. The optical data links have low power consumption and are compatible with IEEE 802.3u Fast Ethernet data communications standards, making them an attractive interface for a variety of applications. Available in active device transceivers, adapters, cables, and field termination tooling, this system can be employed in consumer electronic devices such as audio, video, home networking, and entertainment equipment. They are also well suited to OEM equipment applications such as data link solutions and networking markets, including industrial, home/office network PC, and server applications.

"By re-tooling the SMI optical transceivers, Molex is able to continue providing innovative technologies and designs in high speed data connections," said Tom Marrapode, director of marketing at Molex Incorporated. "Its flexible mounting capabilities and reduced housing space frees valuable PCB real estate, quickly making the SMI POF interconnect system vital to compact POF based product designs."

Utilizing Firecomms RCLED-based 650nm FOT TX/RX transceivers, Molex SMI based data links offer high-speed long-distance links with data speeds up to 250Mbps for 50 meters. The Firecomms FOTs have digitally integrated driver circuitry to reduce PCB real estate and are compatible with CML signaling for seamless integration into Ethernet hubs. The FOT system's high sensitivity receiver IC and pin-diode for one-step light-to-digital conversion also allows integrated optics to efficiently focus and direct light.

"The newly redesigned SMI component system from Molex is well positioned to support the continued growth of POF in the consumer and industrial marketplace," said Lawrence Thorne, vice president of sales and marketing for Firecomms. "Firecomms is pleased to power Molex's SMI transceivers with our industry-leading FOT products."

With surface or through-hole soldering mounting options, the SMI transceivers have been reduced in size and now allow for lower-cost, high-volume surface mount processing. SMI offers duplex, push-pull positive latching with a safe-release mechanism for consumer applications, providing secure and safe demating features. Additionally, the easy no-epoxy, no-polish field termination process, with specialized tooling, gives installers quick and simple field terminations.

The SMI transceiver will be available for sampling in July 2007 with a six- to eight-week lead time. Additionally, the complete line of Molex SMI products, including adapters, cable assemblies, tooling, and receptacles, is available in the United States through Fiber Optic Center, a stocking distributor of Molex fiber optics products located in New Bedford, Massachusetts, at

www.focenter.com; or by Compricon, a stocking distributor located in the Netherlands, at www.compricon-shop.nl. For more information on the Molex SMI Interconnect Products, visit http://www.molex.com/fiber/smipof.html.

MERGERS AND ACQUISITIONS

Molex announces acquisition of Polymicro Technologies

Molex Incorporated, a global electronic components company, announced that it has completed its acquisition of Phoenix, Arizona-based Polymicro Technologies LLC. This acquisition is not financially material to the results of Molex, and terms of the transaction were not disclosed.

Polymicro Technologies LLC manufactures silica capillary tubing and specialty optical fibers, optical fiber and capillary assemblies, discrete micro components, and quartz optical fiber ferrules. It offers a total manufacturing solution, providing initial product design, product and process development, prototyping and beta trials, and volume production. Industries served include analytical, medical, aerospace, military, manufacturing, telecommunication, and communication.

According to Michael Nauman, president, Global Integrated Products Division, Molex Incorporated, this is a strategic acquisition that will help Molex boost its share of the global fiber-optic assemblies market.

“Polymicro Technologies products and capabilities will expand Molex’s fiber-optic offerings in key markets that include medical, military and telecommunications,” said Nauman. “With more than 20 years in these growing markets, Polymicro Technologies is a respected industry leader with a strong customer base and an excellent group of talented and experienced people. With Molex’s global resources we are confident that together we will grow even faster in key markets in the global fiber optics industry.”

According to Gary Nelson, Polymicro Technologies LLC president and general manager, Polymicro also offers Molex penetration into the analytical, genomic, and biotechnology markets that use optical fiber, micro-components, optical fiber ferrules, capillary tubing, and assemblies. “The combination of Molex’s global footprint and resources with Polymicro’s technologies will help expand our offerings globally. The employees and management staff at Polymicro Technologies are excited to join the Molex family.”

Polymicro Technologies LLC has been in business since 1984 and employs approximately 100 people. It will operate as a subsidiary of Molex Incorporated and will be part of the company’s Global Integrated Products Division.

Molex Incorporated is a 69-year-old manufacturer of electronic components, including electrical and fiber-optic interconnection products and systems, switches, and integrated products, with 65 plants in 20 countries throughout the world.

BUSINESS

Firecomms licenses OptoLock plugless transceiver to COMOSS

Firecomms announced that it has licensed its OptoLock interconnect technology to COMOSS Electronic Co. of Taiwan. OptoLock, which was originally introduced in Firecomms’ Fast Ethernet fiber-optic plugless transceiver, is an easy-to-use, low-cost housing for instant termination of bare plastic optical fiber (POF).

"As a leader in interconnect technology, COMOSS is positioned to expand the market for this new POF port," said Firecomms' CEO, Declan O'Mahoney. "COMOSS is the first company to license the OptoLock concept for its products. Firecomms will continue to license this technology to any company that commits to use our transceivers in their products."

OptoLock can be used in Fast Ethernet hub ports directly as it is fully compatible with the IEEE 802.3u Fast Ethernet data communications standard. The RCLED (resonant cavity light-emitting diode) operates at 660+/-10nm peak wavelength. This device is mechanically and electrically interchangeable with SMI (Small Media Interface) connectors enabled by Firecomms EDL300 transceivers, which are widely used.

COMOSS offers OptoLock as model number OLKDX. Said Stanley Tsai, CEO of COMOSS, "Combining Firecomms' OptoLock device with COMOSS connector technology enables us to create very cost-effective transceiver products for the IPTV, consumer, and industrial fiber market."

Firecomms expands European sales through a strategic agreement with MEV Elektronik

Firecomms Ltd., a developer of high-speed plastic optical fiber (POF) transceivers and surface emitting lasers (VCSELs), has significantly expanded its European sales channel through a strategic partnership with MEV Elektronik Service, GmbH (http://www.mev-elektronik.com). With over 15 years of experience in the market, MEV will represent Firecomms across central Europe in the key markets of Germany, Austria, and Switzerland.

"We are delighted to have entered into this strategic relationship with MEV Elektronik Service," said Hugh Hennessy, Firecomms' vice-president of worldwide sales and marketing. "MEV's depth and breadth of experience in the industrial, automotive and consumer electronic industries brings enormous benefits to support our rapidly growing sales in the region."

"Entering into this highly synergetic relationship with Firecomms supports our vision to bring the latest innovative technologies to market," said Wiho Herkenhoff, marketing manager at MEV Elektronik Service, GmbH. "Firecomms' innovative transceiver devices for plastic fiber fit perfectly with our current customer base, so we are able to immediately begin driving this business very aggressively with our customers."

Firecomms signs representative agreement with Prohubs to expand business in Taiwan

Firecomms Ltd. announced that it has signed a representative agreement with Prohubs International Corp. of Taipei, Taiwan (www.prohubs.com.tw). Prohubs will market and sell Firecomms' full range of fiber-optic transceiver products, which are rapidly being adopted by developers of equipment for the consumer electronics, industrial, and automotive networks worldwide.

"Firecomms is delighted to begin working with Prohubs in Taiwan," said Firecomms' general manager for Asia Pacific, Niall Keegan. "Its strong presence in the Taiwanese communications market coupled with its synergistic line-card made Prohubs a natural fit for us. Prohubs' experienced product marketing and technical support teams also will be of tremendous importance to Firecomms as we look to further expand our business in Taiwan."

"Firecomms is a world-leader in the development of fiber-optic transceivers for POF," said Vincent Wang, president of Prohubs. "Firecomms will strengthen our line-card to allow us to offer a much more complete solution to many of our customers who are looking to develop new products for the POF market."