

# RSOFT

Design Group

# REVIEW

Volume 2 Number 1

## RSoft Design Group Acquires Assets of ARTIS

You'll find *OptSim* and *Artifex* in the RSoft booth, #2862

If you're looking for the ARTIS booth at this year's OFC, you won't find it. Instead, head to booth #2862, where RSoft Design Group is exhibiting, and you'll find what you're looking for: ARTIS' *OptSim*<sup>™</sup> and *Artifex*<sup>™</sup> are now part of RSoft — the only company to offer a full range of simulation and planning software and services that span the entire component- to network-level hierarchy.

On January 7, 2003, RSoft announced it had acquired the intellectual property assets of and hired key employees from ARTIS. *OptSim* is a software tool for the simulation of optical communication systems; *Artifex* is a modeling and simulation environment for the design and validation of network technologies. This acquisition makes RSoft a top supplier of fiber optic network and link simulation software.

"We're excited to be able to show the ARTIS tools as part of the RSoft product family for the first time at OFC," stated Dr. Robert Scarmozzino, CEO of RSoft Design Group.

"The combination of ARTIS' *OptSim* and RSoft's *LinkSIM*, both top ranking tools in optical system simulation, will make RSoft Design Group the premier supplier of this line of software worldwide. The acquisition is a perfect example of RSoft's intent

to continue increasing our lead in the global marketplace."

RSoft has hired key personnel in sales, technical support, and development from ARTIS, and will continue to support the company's products.

"ARTIS customers are enthusiastic about this development. RSoft Design Group has a solid reputation for support and quality products that is consistent with ARTIS' past philosophy and standards. The technology behind the two companies' solutions is complementary and will enhance the tools we offer our customers," stated Alessandro Arnulfo, who has joined RSoft from ARTIS, where he managed ARTIS' operations in the U.S. and Asia. You can read more from Arnulfo in the "Meet Alessandro" feature on page V.

The former ARTIS software packages are available now through RSoft Design Group. RSoft will continue supporting users of ARTIS software, and *OptSim* and RSoft's *LinkSIM*<sup>™</sup> will be merged into a single, unified platform that takes advantage of the strengths of both tools. ARTIS' *Artifex* will join RSoft's full spectrum photonics and network design automation family as a new modeling and simulation environment.

Stop by our OFC booth, #2862, for more information on this acquisition. ■



RSoft Design Group's software solutions cover four areas—Component Design, System Simulation, Network Modeling, Strategic Analysis.

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# RSoft Design Group Expands Globally With The Opening Of A New Japanese Office



Toru Ozaki, formerly of Sony/Tektronix, has been appointed president of the Japan office.

Asia's photonics market is estimated to surge to \$700 billion by 2025, with Japan leading the way. To tap into this market, RSoft Design Group announced the opening of its Japanese headquarters in Tokyo, Japan in October 2002. Representing another milestone in RSoft's growth and its commitment to the Japanese market, RSoft Design Group Japan, KK, provides business development and customer support to the company's clients in that country.

Toru Ozaki, president of the Japan office, brings sales expertise from Sony/Tektronix. Sony/Tektronix represented the RSoft product line in Japan before the company opened its own headquarters in Minato-ku.

"I would like to see a seamless transition as our accounts are migrated to the new RSoft Design Group headquarters. The opening of the headquarters in Japan will also allow us to easily receive strong tech-

nical support and other services," said Dr. Masaya Notomi, Distinguished Technical Member, Nano-structure Materials Research Group, Materials Science Laboratory, NTT Basic Research Laboratories.

There is already positive news coming from the newest RSoft office. "I'm pleased to be able to say that in the few months since the Japan headquarters was opened, we are already profitable," said Mr. Toru Ozaki. "Even with the current global economic downturn, we foresee an increased sales volume in 2003."

In addition to the office in Japan, RSoft has an extensive presence throughout Asia with marketing operations in China, India, South Korea, Singapore and Taiwan.

For more information, contact RSoft Design Group Japan, KK at Matsura-building, 1-9-6, Shiba, Minato-ku, Tokyo, 105-0014 Japan. The telephone number is +81-3-5484-6670. ■

## *Optical Mesh Networks for the Metropolitan Area: Determining Cost and Restoration Tradeoffs*

As network operators look to migrate their ring-based optical backbones to a more hybrid architecture, finding a simple way to determine the cost and restoration tradeoffs associated with evolving infrastructure and services becomes critical. With the continued debate over which architecture — ring or mesh — is best suited for implementation in metropolitan networks, deciding whether to mesh or not to mesh has become an increasingly confusing concern. RSoft Design Group's *MetroWAND™* Version 3.0 determines whether ring or mesh is the right choice by building a cost-optimized network factoring in protected, unprotected, and preemptible equipment and demands, as well as various restoration schemes.



A key enabler for metropolitan mesh networks is the availability of the Multi-Service Provisioning Platform (MSPP). MSPP is a technology that consolidates SONET and DWDM

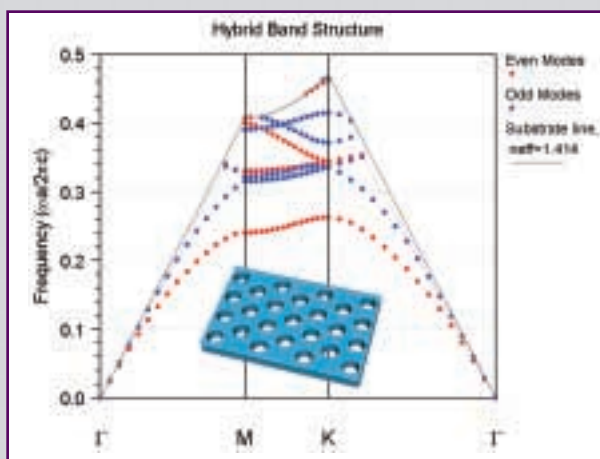
multiplexers; SONET plug-ins for DWDM multiplexers; standard SONET, data, and electrical interfaces; and switching capability into a single frame. MSPP can prove-in solely based on its ability to centralize powering and frame costs, while also serving

# *BandSOLVE* Upgrade Targets the Design of Photonic Crystal Slabs

Photonic crystal (PC) slab geometries attract a lot of attention because they have many of the advantages of 3D photonic crystals, but can be produced using relatively standard fabrication techniques. PC slabs are 3D structures that are periodic in two dimensions, and rely on conventional waveguide confinement in the vertical direction. An important issue when modeling PC slab waveguides is to distinguish bound modes from leaky or radiation states. It's also necessary to calculate the mode parity in order to determine the bandgaps for the PC slab structures. *BandSOLVE*™ Version 1.1 provides the tools to accurately address these concerns.

In order to isolate the guided modes of a PC slab, *BandSOLVE* can now filter the calculated modes in order to remove radiation states above the slab's light line. This feature not only aids in the analysis of a PC slab structure, but it also substantially reduces the computation time. Moreover, for slabs with one or more planes of reflection symmetry, the parity of the modes can be enforced so that

only even or odd modes are found. This allows the user to classify the modes as TE- or TM-like, which is essential in determining bandgaps for PC slab structures. The accompanying figure shows both the even and odd guided modes which lie below the light line of a typical PC slab structure as solved for with *BandSOLVE* 1.1.



In addition to these PC slab-specific features, new options have also been introduced in the index generation engine to further increase the accuracy and convergence of the simulation. This includes optional tensor averaging at index boundaries as well as increased user control over the averaging algorithms. Finally, the user now has more flexibility in specifying the location and orientation of cut planes for 1D and 2D problems.

PC slabs present an exciting area of research and development, and *BandSOLVE* Version 1.1 provides the necessary tools to accurately design, simulate, and analyze them. ■

the cross-connect and re-routing function necessary for mesh. Thus, the advent of MSPP enables service providers, equipment providers, and component manufacturers to evaluate mesh architectures along with rings in metro areas.

Survivable network architectures based on mesh topologies have generated significant interest among service providers. Using *MetroWAND*, two problems of practical importance can be solved: routing and planning of working capacity, and re-routing and planning of spare capacity. The tool supports a suite of protection and restoration paradigms. Restoration capacity can be reserved on each link, path, or any intermediate segment. *MetroWAND* also enables the user to specify the percentage of traffic to be distributed over different working and restoration routes. The user can specify a restoration guarantee — a quality of service param-

eter — that specifies the percentage of traffic to be restored upon a failure. Several "what if" scenarios with regard to resource budgeting for restoration can be modeled using these features. The network service provider can then compare the cost of budgeting extra capacity for tolerating failures to the additional revenue that comes with providing such a capability.

It is the nature of metro area networks that they include a mix of technologies in their legacy and emerging network architectures. In such a heterogeneous environment, making the right design choice is fairly complex. RSoft's *MetroWAND* is the only commercial ring and mesh tool to address the complex multi-service nature of metro network design and to determine the costs associated with particular architecture and restoration alternatives. ■

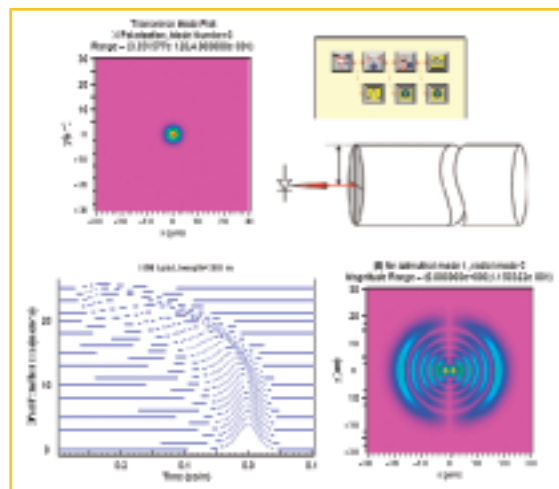
# RSoft Design Group Intros Industry's First Multimode Link Simulation Platform

Deployments of networks using high-speed data communication protocols such as Gigabit Ethernet have risen dramatically in recent years. Unfortunately, the methodologies used to design these systems have not kept pace. While long-distance telecom networks are designed with single-mode fibers and components, short-haul datacom systems are typically designed with low-cost, multimode elements. There are several commercial CAD packages that address the design of single-mode systems, but only RSoft's *LinkSIM*<sup>™</sup> aids in the design of multimode systems. This multimode link simulation utilizes RSoft's strength in device-level modeling and uniquely combines the necessary simulation capabilities at both device and link levels.

Single-mode systems, by definition, focus all of the signal energy into one or more polarizations of a single transverse mode; the signal energy either enters the one mode of a device or it does not.

Consequently, single-mode system design tools simulate only the time-domain waveform for each polarization. On the other hand, multimode systems require the analysis of time

and space. It is not sufficient to determine how much signal energy enters a multimode device; rather, it is necessary to determine how much energy enters each of the multiple modes of the device. This requires a 3D spatial analysis of the signal for each polarization. Different temporal characteristics for each mode further



Clockwise from upper left: input beam for DMD measurement, simulation topology, DMD measurement schematic, representative fiber mode profile, fiber's differential mode delay.

exacerbate the problem. As a result, each polarization of a multimode signal requires a unique spatio-temporal representation.

One application of *LinkSIM*'s multimode configuration is to simulate the delay attributes of a multimode fiber. A typical fiber supports hundreds of guided modes, each possessing a unique spatial distribution

and propagation delay. By scanning a pulse of light across the fiber face, a set of output waveforms can be generated as a function of the source position — this is known as the fiber's differential mode delay (DMD). The DMD gives a good indication of the source/fiber positioning tolerance for a target system bit rate. To generate the DMD, it is necessary to determine the amount of input energy that couples into each of the fiber's guided modes, to propagate this energy down the fiber at each mode's characteristic delay time, and then to assemble this time/space information into an output waveform. This process must be repeated for each input position.

Because of the complexity of multimode simulation, engineers often give up on analysis and instead rely on empirical, measurement-based, experimental design techniques. Unfortunately, these methods are time consuming and inefficient, and often produce non-scalable solutions that are applicable to only a single product or protocol design. In the past, the lack of a multimode design infrastructure resulted in higher design costs and longer time-to-market. Today, the *LinkSIM* multimode simulation platform enables cost-effective and time-efficient designs for multimode optical communication systems. ■



# RSoft Purchases ARTIS IP: The ARTIS Perspective



## Meet Alessandro:

*Alessandro Arnulfo, Senior Sales Engineer, has more than 6 years of experience in the field of electromagnetic and photonics design automation as a software engineer, application engineer, and sales and business development manager. Alessandro joined RSoft from ARTIS, where he managed ARTIS' operations in the U.S. and Asia. He has a MS EE from the Politecnico di Torino.*

**RSoft Review:** In what ways do you think RSoft will benefit from this acquisition?

**Arnulfo:** ARTIS' strength wasn't only in its code, it was in its people. RSoft recognized this asset and hired a number of key employees, including myself, from ARTIS in sales, technical support, and development. As a result, we brought the knowledge of the optical market, our good customer relations, our reputation for excellent support and services, and all the technical skill of our development and support teams to RSoft. All of these benefits will enable us to serve the combined customer base even better.

**RR:** What has been the reaction of ARTIS' former customers?

**Arnulfo:** There was a prompt response from our customers, and it was overwhelmingly positive. They definitely realized that this acquisition would be beneficial to them. Customers who were using products from both ARTIS and RSoft — for example, *OptSim*<sup>™</sup> for their system simulation and *BeamPROP*<sup>™</sup> for their component design — were especially happy to know that ARTIS' and RSoft's products would now be developed and marketed by the same company.

**RR:** How will the technologies of each company work together?

**Arnulfo:** The technologies are perfectly complementary. For instance, *OptSim* has an extremely powerful engine for handling long sequences of data quickly and accurately. *LinkSIM*, on the other hand, is unique in that it can handle multimode fiber simulations. *LinkSIM* also has some very advanced models for components — such as VCSELs, EDFAs, and other devices — that are more detailed than some of the *OptSim* models. And *OptSim*'s Time Domain Split Step method will complement the Split Step Fournier method in *LinkSIM*.

**RR:** Any final thoughts?

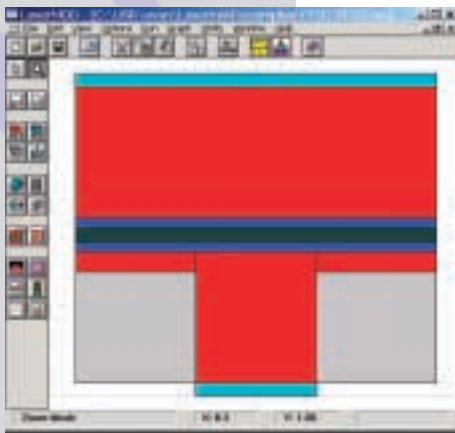
**Arnulfo:** With this acquisition, RSoft is probably the strongest player in the market — we're certainly the only ones with a product suite that spans the entire component- to network-level hierarchy. The optical simulation market is still a young one; formats, standards, and modeling languages haven't been settled yet. RSoft is now, more than ever, ready to help lead the growth of this market. ■

# LaserMOD Extends RSoft's Product Suite to Include Active Component Design Tools



As key components in optical telecommunication systems, semiconductor lasers continually have demands for improvements in power dissipation, bandwidth, tunability, temperature stability, and noise figure placed upon them. Many complex physical processes occur in lasers that govern their performance, and sophisticated simulation tools are required to allow designers to bring their devices to market in a timely fashion.

*LaserMOD*™ is the tool you need to address these issues, and it extends RSoft Design Group's product suite to include active components. Currently, *LaserMOD* focuses on Fabry-Perot and DBR type edge-emitting lasers in multiple dimensions. For broad area lasers or initial characterization of a complex device, the analysis can be reduced to 1D to save computation time. A 2D simulation allows for the investigation of the detailed mode confinement or current leakage effects. Future releases of the tool will address VCSELs, DFBs and SOAs, and other devices geometries.



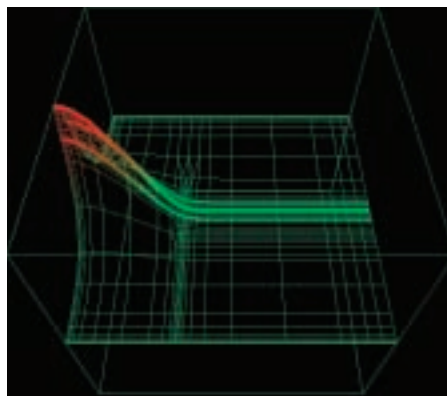
CAD layout of a MQW p-down ridge Fabry-Perot laser diode.

The *LaserMOD* package includes advanced gain calculations, mode solvers, a bias point-driven simulation engine, a nonuniform mesh generator, material libraries, plot generation and viewing utilities, and online documentation all integrated into a single, user-friendly, parametric graphical CAD interface.

The gain calculation includes an 8x8 band K-P method that accounts for strain and bandgap renormalization. A general look-up

table-based model is also available, which allows users to employ their own gain models or measured data. Gain spectra libraries for a variety of material systems obtained by advanced microscopic many-body calculations — including a quantum mechanical treatment of carrier-carrier and carrier-phonon interaction offered by NCS, Inc. — are available through RSoft.

The internal mode solvers are augmented through the integration of *LaserMOD* with complementary tools from RSoft Design Group: *BeamPROP*™ and *FullWAVE*™. VCSEL cavity modes, for example, can be determined through the FDTD method employed by *FullWAVE*.



Near field distribution over the nonuniform mesh — left side is the plane of symmetry at the center of the ridge.

*LaserMOD*'s simulation engine is based on the Minilase II program from the University of Illinois, which rigorously treats the transport across quantum wells by employing rate equations to couple carrier populations in both bound and continuum states. Lateral drift

within the quantum wells, transverse and longitudinal mode competition, and carrier dependent index variation are all accounted for.

*LaserMOD*'s advanced transport and gain models are solved self-consistently with the optical problem to predict both steady-state and transient device performance. Coupled with an arsenal of standard and custom plot generation features, *LaserMOD* — along with the other component design products from RSoft — provide a unique solution for both active and passive device design. ■

# TOOLS FOR TODAY

## Preview our latest products at OFC 2003



### BandSOLVE™

A fully integrated module in RSoft's component-level design suite (with *BeamPROP*, *FullWAVE*, and *GratingMOD*), *BandSOLVE* automates

and band structure, transient response, and many other standard and custom plots. Read more on page vi.



### GratingMOD™

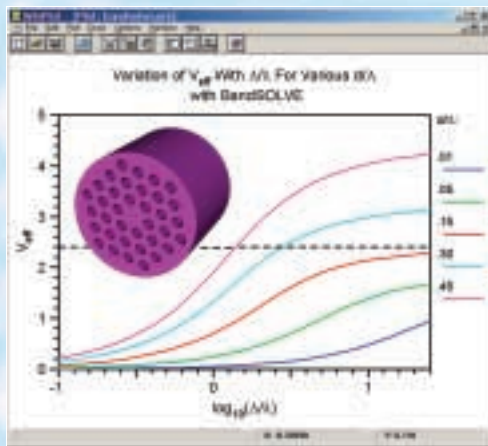
*GratingMOD*, a fully integrated module in RSoft's component-level design suite (with *BeamPROP*, *FullWAVE*, and *BandSOLVE*), is a coupled mode theory-based tool for analyzing grating structures. It handles gratings with arbitrary cross sections, and can analyze gratings with user-defined chirp and apodizations. *GratingMOD* can synthesize a grating from a known spectral response, accept the spectral response for a system, and then output what the design of the grating must be in order to represent the desired response.

vendor's fiber in a variety of EDFA designs. A wide range of design scenarios may be investigated, including different pumping schemes, multi-stage amplifier configurations, and much more.



### LinkSIM™ – Multimode Configuration

*LinkSIM*'s multimode configuration supports the design, analysis, and simulation of multimode communication systems. With a primary focus on datacom applications, the multimode configuration allows users to evaluate both temporal and spatial attributes of optical signal propagation, enabling the system-level analysis of standardized communication technologies such as 1 Gb and 10 Gb Ethernet and Fibre 10 Gb Channel. *LinkSIM*'s multimode configuration offers advanced capabilities that are unavailable anywhere else. Read more on page iv.

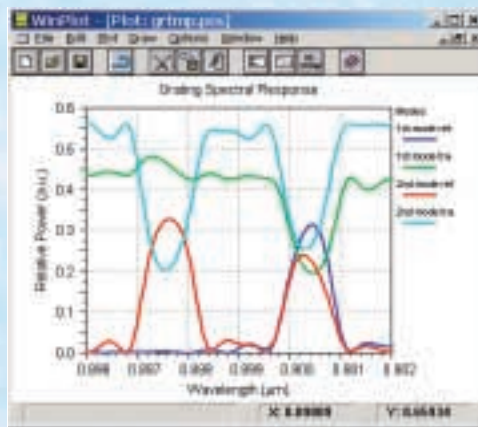


and simplifies the calculation of photonic band structures for photonic crystal devices. *BandSOLVE* deals with a large range of standard crystal lattices in one, two, or three dimensions, including FCC, BCC, diamond, logpile, and PC slabs. With *BandSOLVE* 1.1, users can now measure the parity of any mode, or explicitly request that only odd or even modes be calculated. Read more on page iii.



### LaserMOD™

*LaserMOD* is used for laying out active device cross-sections, selecting material parameters, generating non-uniform grids, running simulations, and plotting results. The tool is focused on Fabry-Perot laser cavities, but has been designed to be extendible to VCSEL and DFB structures. Both steady-state and time-dependent carrier transport are simulated. Outputs include L-I and I-V curves, near and far field, charge and current distributions, energy bands



### LinkSIM™ – EDFA for Vendors

Er-doped fiber vendors want to be able to offer customers flexible simulation software with their fiber shipments. To address this need, RSoft's *LinkSIM* – EDFA for Vendors allows customers to use encrypted data such as the Giles parameters to simulate a



### MetroWAND™ – Mesh Capabilities

Mesh topologies are proven in long-haul networks, but does it make sense to implement mesh in your metropolitan network? *MetroWAND* 3.0 can help determine if mesh is right for you by building a cost-optimized network factoring in protected, unprotected, and preemptible equipment and demands, as well as various restoration schemes. It can even build a mesh network on top of your existing ring network. *MetroWAND* 3.0 is the only network design tool that optimizes ring, MSPP, and mesh architectures. Read more on page ii.

## In The Media

*Lightwave* magazine has published "Optimized duobinary system designs save costs," by RSoft's Jigesh Patel, in its March 2003 issue. Read the full article at <http://www.lightwaveonline.com>, in the Web Exclusives/Features section.

802.11 Planet reviews *WirelessSWAT*, and calls it "an invaluable and cost saving tool." The full review is available at <http://www.80211planet.com/reviews/SW/article.php/1547741>

"Planning for Success: A Case Study for WISPs," by RSoft's Pete Arnold, was published in *Broadband Wireless Business* magazine. This detailed case study explains how *WirelessSWAT* can be used to analyze deployment impacts for wireless Internet Service Providers. Read the article at <http://www.shorecliffcommunications.com/magazine/volume.asp?Vol=31&story=304>



# IN BRIEF

## VISIT US AT:



## OFC 2003, Booth #2862

Join us in Room B315 for mini-training seminars and to hear product presentations with case studies. Or, stop by Room B316 for an informal chat with our engineers at one of our "Meet RSoft" sessions. A schedule is available at our booth and outside the meeting rooms.

You can also catch up with RSoft at these Exhibitor Showcases in Exhibit Hall C1, Room ES2:

- Software Solutions for the Design and Optimization of Optical Components  
**Tuesday, March 25 at 11 AM**
- Software Solutions for the Simulation of Optical Communication Systems  
**Wednesday, March 26 at 11 AM**



## NFOEC 2003 September 7-11th, 2003 Orlando, FL

## RSoft Training Seminars

Visit <http://www.rsoftdesign.com/support/training.cfm> for the latest details on our training seminars around the country.

Can't find a convenient location or time? We'll come to you. E-mail us at [info@rsoftdesign.com](mailto:info@rsoftdesign.com) for information on setting up RSoft training seminars in your office.

### Physical-Layer Division

200 Executive Boulevard  
Ossining, NY 10562  
Phone: 914.923.2164

### Network-Layer Division

19 Christopher Way  
Eatontown, NJ 07724  
Phone: 732.380.2620

email: [info@rsoftdesign.com](mailto:info@rsoftdesign.com)  
Web: [www.rsoftdesign.com](http://www.rsoftdesign.com)

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*Full Spectrum Photonic and  
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