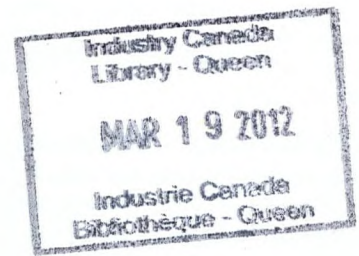


Wireless Broadband

Canada Paving the Way



**A showcase of
Canada's wireless
broadband
technologies
and services**

**May 19, 1998
Toronto**



Communications & Power Industries Inc. (CPI)

Communications & Power Industries Inc. (CPI) originated in 1948 as the founding technology group of Varian Associates. In 1995, the Varian Electron Device Business and its six divisions became CPI Inc. CPI Canada Inc., a subsidiary of CPI, was established in 1954. CPI Canada has been a pioneer in the development of LMDS/LMCS equipment since the early 1990s. Most companies evaluating LMCS around the world use, or have used, CPI amplifiers. These amplifiers are generally used in the hub transmitter.

In 1996, CPI Canada launched a new high-power broadband amplifier specifically designed for LMDS/LMCS and suitable for both analog and digital deployable systems. Today, CPI is developing new lightweight, high-linearity Power Booster Amplifiers (PBAs). These amplifiers combine the benefits of solid state and vacuum technologies in a single compact package. The PBAs are ideally suited to sectorized LMDS cell configurations where high system capacity and availability are critical.

CPI has been involved in manufacturing terrestrial, line-of-sight telephony and satellite communications amplifiers for more than 30 years. CPI has been a pioneer in the development of millimetre-wave devices and subsystems, which can be found at all major millimetre-wave research facilities around the world. The firm is actively following developments of terrestrial distribution systems at other high frequencies and intends to provide amplifiers for these systems as markets develop.

Contact:

Colin Eastment
Communications Products Marketing Manager
Communications & Power Industries Canada Inc.
45 River Drive
Georgetown ON L7G 2J4
Tel.: (905) 877-0161
Fax: (905) 877-5327
E-mail: colin.eastment@cmp.cpii.com
Internet: <http://www.cpii.com/cmp>



Communications Research Centre (CRC)

The Communications Research Centre (CRC), an Institute of Industry Canada, conducts R&D on a broad range of communications and related technologies in terrestrial wireless, satellite communications, broadcast technology, broadband networking and the underpinning microelectronic and optical technologies that support high-speed networks. Contracting-in, collaborative research and licensing are the main mechanisms for transferring knowledge to Canadian firms.

CRC has recently redefined its R&D program, recognizing that wireless R&D is its main line of business. CRC is developing new concepts for fixed broadband wireless communications to meet the growing demand for interactive multimedia applications.

In the area of microwave and millimetre-wave components, CRC has designed and developed antennas and MMICs for both satellite and terrestrial wireless communications. Technologies ready for licensing include antennas, up-converters, down-converters, oscillators, amplifiers and mixers, among others.

In November 1997, CRC announced the creation of the Distributed Broadband Wireless Testbed, a joint project of CRC, WIC Connexus, Ottawa-Carleton Research Institute (OCRI) and OCRI.net. The testbed is designed to evaluate new techniques, technologies and applications for broadband wireless. Transmission interface between wireless and wireline networks is a key area which the testbed will address.

The concept is based on industry members bringing in their own system components for demonstration and "plug and play" evaluation. WIC Connexus has been collaborating with CRC on field tests of modulation techniques for video transmission over local multipoint communications systems.

Contact:
Debbie Kemp
Marketing Officer
Communications Research Centre
3701 Carling Avenue
Ottawa ON K2H 8S2
Tel.: (613) 998-4287
Fax: (613) 998-5355
E-mail: debbie.kemp@crc.doc.ca
Internet: <http://www.crc.doc.ca>



Harris Corporation Farinon Division

Harris Corporation's Farinon Division, a world leader in the manufacturing of microwave communications systems, is pleased to be part of the wireless convergence of telecommunications, broadcasting, and computing environments.

In collaboration with partners, the Farinon Division of Harris has developed a point-to-multipoint (PMP) system which has successfully completed field trials in Mexico. Plans are in place to expand this offering to other frequency bands. The Farinon Division has also been involved in studying the network engineering aspects of PMP installations at 28 GHz for WIC Connexus across Canada. Applications considered include broadcast video and interactive multimedia (high-speed data, images, and voice). In addition, Harris has been a participant in the CTR (Canadian Institute for Telecommunications Research) Broadband Wireless Research Program at Carleton University.

Other important elements of an LMCS network are high-capacity, point-to-point microwave radios. Harris has the ideal wireless solution for the interconnection of hubs, dedicated access service and backhaul of traffic to the public network. Harris can even help in the early stages of planning the network by providing network engineering and system design services to address the many potential propagation and interference issues associated with implementing PMP networks.

With more than 38 years of experience, Farinon Division – the largest supplier of microwave systems in North America – offers a full range of high-quality transmission equipment in the 2 to 38 GHz frequency bands, and capacities up to OC-3, to a customer base in over 140 countries.

Contact:

John Kovalci
Product Manager
Harris Corporation, Farinon Division
3 Hotel de Ville
Dollard des Ormeaux QC H9B 3G4
Tel.: (514) 822-2211
Fax: (514) 421-0979
E-mail: jkovalci@harris.com
Internet: <http://www.farinon.harris.com>



NEWBRIDGE

Newbridge Networks Corporation

Newbridge Networks Corporation designs, manufactures, markets and services a comprehensive family of networking products and systems that delivers the power of multimedia communications in more than 100 countries, including the world's 200 largest telecommunications service providers, and more than 10 000 public and private enterprises, government organizations and other institutions.

In 1996, Newbridge formed the Wireless Networks group to address opportunities afforded by worldwide telecommunications deregulation and advances in microwave technology. The Newbridge solution for broadband wireless operators provides access to the wireline environment. The solution includes base station radio interface equipment; transmitters, receivers, repeaters and transceivers; network interface equipment; and end-to-end network and service management.

Networks are currently deployed in North America and the Asia-Pacific regions, serving as evaluation sites for customers planning regional and nationwide roll-outs.

The technology can be applied as a competitive access solution for alternate carriers or as a complementary last-mile solution for incumbent carriers with spectrum licences in frequencies from 20 to 40 GHz.

The Newbridge solution offers several key benefits:

- an integrated multiservices access platform;
- scalable architecture for a cost-effective, demand-based build-out;
- simultaneous data, Internet, voice and video traffic over the air;
- a proven network and service management system;
- frequency flexibility for LMCS and other spectrum opportunities; and
- ease and speed of deployment, to capture high-value customers.

Contact:
Sheila Burpee
Marketing Program Manager
Wireless Networks
Newbridge Networks Corporation
600 March Road, PO Box 13600
Kanata ON K2K 2E6
Tel.: (613) 591-3600 ext. 3833
Fax: (613) 599-3686
E-mail: sburpee@newbridge.com
Internet: <http://www.newbridge.com>



NII Norsat International Inc.

NII Norsat International Inc. is a diversified technology company specializing in the design and manufacturing of satellite and cable communications equipment for commercial applications. Norsat sells its products through its offices in Canada, the U.S., the U.K., China and Singapore, and through a worldwide network of more than 35 distributors. A world leader in the supply of Ku-band commercial satellite receivers (LNBs), Norsat also supplies Ka-band radio terminals for interactive multimedia satellite and LMCS systems.

Norsat has assembled a technical integration team to assist LMCS carriers in preparing their networks for successful roll-out, with competencies in:

- architecture design and analysis;
- Ka-band coverage analysis and prediction; and
- project management and implementation.

Norsat system reference models for LMCS are based on a low-cost architecture suitable for initial deployment and growth in conjunction with market demand. High-percentage coverage is provided to residential and business subscribers from overlapping cells. Signals are distributed to base stations using inter-cell links, or wireless broadband radio relays operating within the LMCS band. The frequency plan is designed to optimize performance in an interference and power-limited environment, based on a detailed link budget analysis that considers the atmospheric effects of rain attenuation and multipath for Ka band.

Norsat recently introduced a narrow-beamwidth subscriber radio terminal designed for receive-only communications at LMCS frequencies of 27.35 to 28.5 GHz. The LNB/antenna interface—via the WR28 waveguide—provides flexibility in the choice of antenna and system performance. Development is under way for two-way interactive LMCS subscriber radio terminals.

Contact:
Wolf Strecko
Product Marketing
NII Norsat International Inc.
302 - 12886 78th Avenue
Surrey BC V3W 8E7
Tel.: (604) 597-6200
Fax: (604) 597-6214
E-mail: info@norsat.com
Internet: <http://www.norsat.com>



NORTHERN TELECOM

Nortel (Northern Telecom)

Nortel (Northern Telecom) addresses global growth markets for digital cellular, PCS, satellite, wireless access and broadband wireless access networks. Nortel offers wireless service operators the strength and experience of an established global network provider; leading-edge digital radio, switching and software technology; rapid network and service deployment; and the industry's most comprehensive portfolio of complete wireless network solutions. Nortel's cost-effective, proven portfolio spans the spectrum of wireless standards and technologies for analog and digital cellular networks, including AMPS, TDMA, CDMA, CDPD and GSM. Nortel provides wireless operators high-quality, revenue-generating business solutions and services that are focused on attracting and retaining subscribers.

Nortel's *Reunion* broadband wireless access is a last-mile solution which delivers full voice, data, Internet and video services at frequencies ranging from 2 to 42 GHz with the reliability, availability and performance of wireline networks. *Reunion* allows telecommunications and multimedia network operators to quickly and cost-effectively provide high-capacity, point-to-multipoint communications services to new and existing business and residential customers.

The *Reunion* portfolio encompasses broadband wireless access products and services. *Reunion* includes base station equipment with multiple interfaces to wireline networks, wireless transmission and reception equipment, customer premises equipment and integrated network management. *Reunion* value-added services include business case analysis, network planning, installation, training and support.

Contact:
Samia Guirguis
Manager, Marketing Communications
Wireless Networks, Canada
Nortel (Northern Telecom)
304 East Mall, 8th Floor
Islington ON M9B 6E4
Tel.: (416) 232-3977
Fax: (416) 232-3996
E-mail: samia_guirguis@nortel.com
Internet: <http://www.nortel.com>



TRL Microwave Technology Inc.

TRL Microwave Technology Inc., established in 1987, specializes in research, development and manufacturing of microwave and millimetre-wave products for the satellite, terrestrial and wireless communications industries. Until 1993, the company's main activities were government and private R&D contracts. Beginning in 1994, the company diversified into designing and manufacturing innovative microwave and millimetrewave components and subsystems for commercial applications.

TRL is widely recognized for its GaAs MMIC and MHMIC design capabilities. Since 1995, TRL has been a supplier of high-quality, high-performance 2.5 GHz MMDS and 20 GHz SATCOM products to international clients. In late 1996, TRL entered into the design and development of broadband wireless systems.

TRL is currently very active in the development of LMCS technology. To date, successful capability demonstrations have been performed in Brazil, Macau, Thailand and Korea. In 1991, TRL was the prime contractor for the European Space Agency Program for a 20/30 GHz synthesized transceiver, proving TRL's technical capability in the 30 GHz range.

In Canada, TRL is working with other LMCS licensees towards a North American LMCS model house. In Korea, TRL is working together with Samsung Electronics Co., Ltd. to supply a two-way, wireless, digital, LMCS testbed system to Korea Telecom.

On the forefront of wireless technology, TRL welcomes opportunities to work with operators and other technology suppliers.

Contact:
Tae Ri (Terry) Lee
President and CEO
TRL Microwave Technology Inc.
8540 Baxter Place
Burnaby BC V5A 4T8
Tel.: (604) 420-4361
Fax: (604) 420-3826
E-mail: terry@trl-microwave.com
Internet: <http://www.trl-microwave.com>



Unique Systems Inc.

Unique Systems Inc., Canadian-owned and operated since 1990, designs and manufactures microwave systems and components. The initial products that the company marketed were waveguide components, together with custom-designed and manufactured RF devices, produced for various commercial and military contracts.

Through continued reinvestment, Unique Systems has grown and is now firmly established in the fast-changing and competitive microwave electronics world. The company is vertically integrated, capitalizing on the use of state-of-the-art equipment, labour and material management to maintain a strong position in the worldwide marketplace.

Unique Systems' broad product mix includes components and sub-systems for digital video broadcast (the DVB Series), digital audio broadcast (the DAB Series) as well as transmission equipment for terrestrial, point-to-point (the Terra Series) and point-to-multipoint (the PmP Series) services such as CATV, MMDS and LMDS. The company continues to be a supplier of many components in the frequency range of 200 MHz to beyond 40 GHz.

Unique Systems' staff comprises more than 65 people, including more than 35 qualified electrical engineers, and Masters of Engineering and PhD-level engineers. The company will continue to invest heavily in the future to ensure that new products are developed along with ongoing improvements to existing products. North American and European firms are poised to team with Unique Systems to supply larger network solutions.

Contact:
Sean East
National Sales Manager
Unique Systems Inc.
181 Don Park Road
Markham ON L3R 1C2
Tel.: (905) 474-0091 ext 149
Fax: (905) 474-1563
E-mail: seane@uniquesys.com
Internet: <http://www.uniquesys.com>



Wi-LAN Inc.

Wi-LAN Inc., of Calgary, Alberta, is a technology leader in spread spectrum wireless data communications, specializing in high-speed Internet access, LAN/WAN extension and remote data collection applications. Wi-LAN's *Hopper* line of wireless modems and wireless Ethernet bridges have been successfully implemented in a wide variety of industry, corporate, education and government applications in more than 25 countries around the world.

Wi-LAN holds patent rights on two LMCS/wireless broadband technologies: multicode direct sequence spread spectrum (MC-DSSS) and wide-band orthogonal frequency divisional multiplexing (W-OFDM). MC-DSSS makes it possible to multiply the carrying capacity of spread spectrum radio transmissions by as much as 10 times. W-OFDM eliminates most of the multipath inefficiencies of conventional orthogonal frequency division multiplexing technology.

OFDM is becoming the standard global technology for wireless broadband. The superior multipath characteristics of Wi-LAN's W-OFDM facilitates the development of products that deliver between 20 and 155 Mbps. The company is currently developing and testing a new line of user-friendly, protocol-transparent, wireless, fast Ethernet and asynchronous transfer mode (ATM) transceivers based on W-OFDM. It is targeting the completion of prototypes capable of transmission speeds over 20 Mbps by the end of 1998. Wi-LAN expects its products to complement other wireless technologies and to become essential components of comprehensive LMCS systems for the delivery of high-speed data and video communications.

Contact:
Dr. Hatim Zaghoul
President and CEO
Wi-LAN Inc.
300 - 801 Manning Road NE
Calgary AB T2E 8J5
Tel.: (403) 273-9133
Fax: (403) 273-5100
E-mail: hatimz@wi-lan.com
Internet: <http://www.wi-lan.com>

Wireless Broadband

Canada Paving the Way

Canada has one of the most advanced telecommunications environments in the world, connecting a sophisticated, technologically literate population across vast distances. Open and competitive investment policies and vigorous R&D incentives have helped Canadian companies develop the innovative new products and services that drive the international telecommunications market.

Canada has earned an enviable reputation in the telecommunications field based on these achievements:

- ▶ the world's first telephone (1874);
- ▶ the first national digital microwave network (1971);
- ▶ the first national geostationary satellite (1972);
- ▶ competitive cellular services since 1984;
- ▶ the most powerful mobile communications satellite; and
- ▶ the longest fibre optic network in the world.

This has led to Canadian communications equipment suppliers establishing a strong presence in many market segments internationally.

Now, Canada is playing a major role in the development of wireless broadband technology. This builds on Canada's strengths:

- ▶ vigorous trade in technology;
- ▶ acknowledged expertise in software, telecommunications products and services; and
- ▶ the best communications infrastructure among the major industrialized countries.

Today, new markets are springing up in direct-to-home television, personal communications services, local multipoint communications systems (LMCS) and digital radio and television broadcasting.

As the first country in the world to license LMCS (known as LMDS in the United States), Canada is proud to present its capabilities and technologies at *Wireless Broadband – Canada Paving the Way*. Carriers, such as WIC Connexus/Regional Vision and MaxLink, are planning to invest more than \$1 billion and create up to 8000 new jobs over the next five years. Other Canadian companies, such as LookTV – whose partners include Teleglobe Canada – are also poised to offer new wireless broadband services featuring such technologies as MDS (multipoint distribution systems), MCS (multipoint communications systems) and MMDS (multichannel multipoint distribution services).

Canadian suppliers showcased in this publication have developed products and solutions to meet the demands for these services in both mature and emerging markets around the world. *Wireless Broadband – Canada Paving the Way* provides a unique forum to foster international partnerships among service providers, equipment manufacturers and government agencies that can take advantage of the many exciting global market opportunities in these new areas.

This conference is co-sponsored by the Canadian Wireless Telecommunications Association (CWTA), the Communications Research Centre (CRC) and Industry Canada, the federal department responsible for spectrum management.



C ontacts

Raymond Lepage

Senior Telecommunications Officer
Industry Canada
300 Slater Street, Room 1803A
Ottawa ON K1A 0C8
Tel.: (613) 954-3319
Fax: (613) 952-8419
E-mail: lepage.raymond@ic.gc.ca
Internet: <http://strategis.ic.gc.ca>



Debbie Kemp

Marketing Officer
Communications Research Centre
3701 Carling Avenue
Ottawa ON K2H 8S2
Tel.: (613) 998-4287
Fax: (613) 998-5355
E-mail: debbie.kemp@crc.doc.ca
Internet: <http://www.crc.doc.ca>



Carrie Moussa

Vice President, Association Affairs
Canadian Wireless Telecommunications
Association
275 Slater Street, 5th Floor
Ottawa ON K1P 5H9
Tel.: (613) 233-4888 ext. 104
Fax: (613) 233-2032
E-mail: cmoussa@cwta.ca
Internet: <http://www.cwta.ca>



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