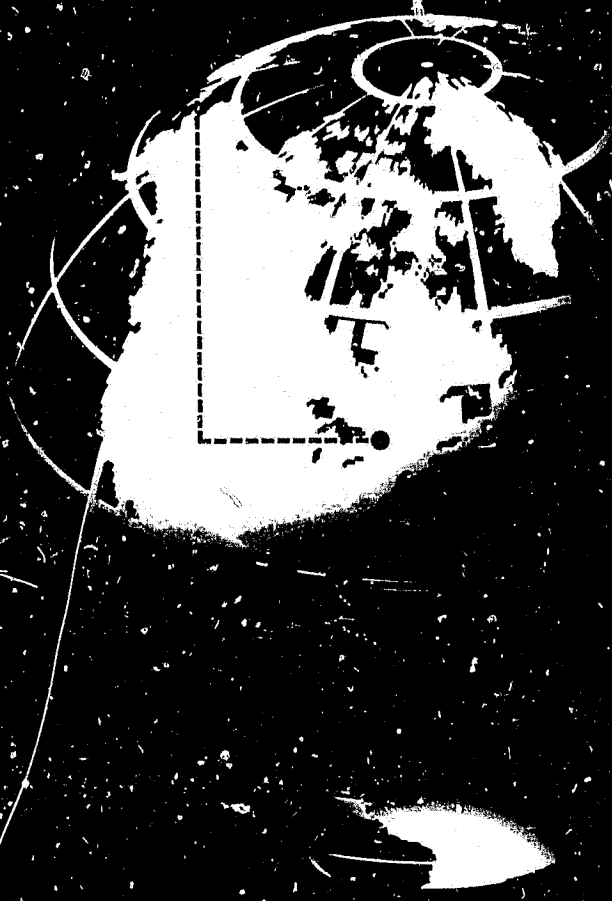


Industry Canada's

C o m m u n i c a t i o n s

R e s e a r c h C e n t r e





New Directions

in

Communications



Meeting the R&D challenges of the 21st Century

As the Information Age gathers momentum in its headlong rush toward the 21st Century, the pace of technological change is accelerating at an unprecedented rate. Nowhere is this more evident than in the information and telecommunications sectors where technology advances have resulted in a fundamental re-engineering of work processes.

Recognizing the need to continue to evolve and respond to these challenges, the Communications Research Centre (CRC) has realigned its research priorities to increase the transfer of industrially relevant R&D to private industry for the creation of jobs and growth in the Canadian economy.

In 1996-1997, following extensive evaluation within the research directorates and consultations with its major clients and industry partners, CRC completed a business plan which refocuses the thrust of its R&D program and charts a course to carry CRC into the next millennium.

CRC Vision

National leadership in collaborative research and development on innovative communications, broadcasting and information technologies for a strong Canadian knowledge-based economy.

CRC Mission

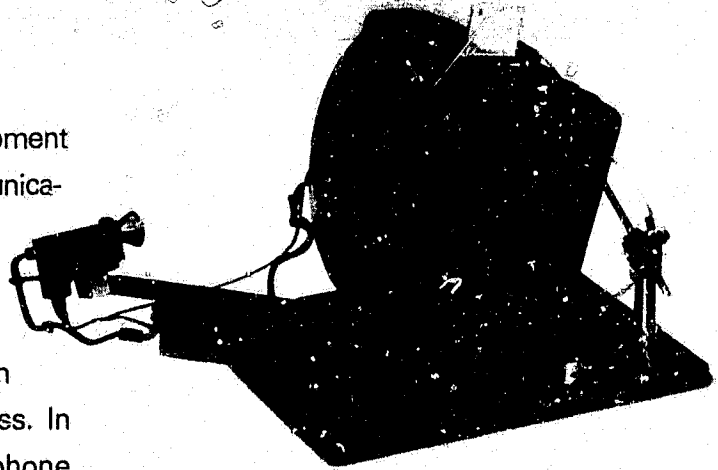
To be the federal government's centre of excellence for communications R&D, ensuring an independent source of advice for public policy purposes.

To help identify and close the innovation gaps in Canada's communications sector by:

- engaging in industry partnerships;
- building technical intelligence;
- supporting small and medium-sized high technology enterprises.

Developing Technologies for the Wireless World

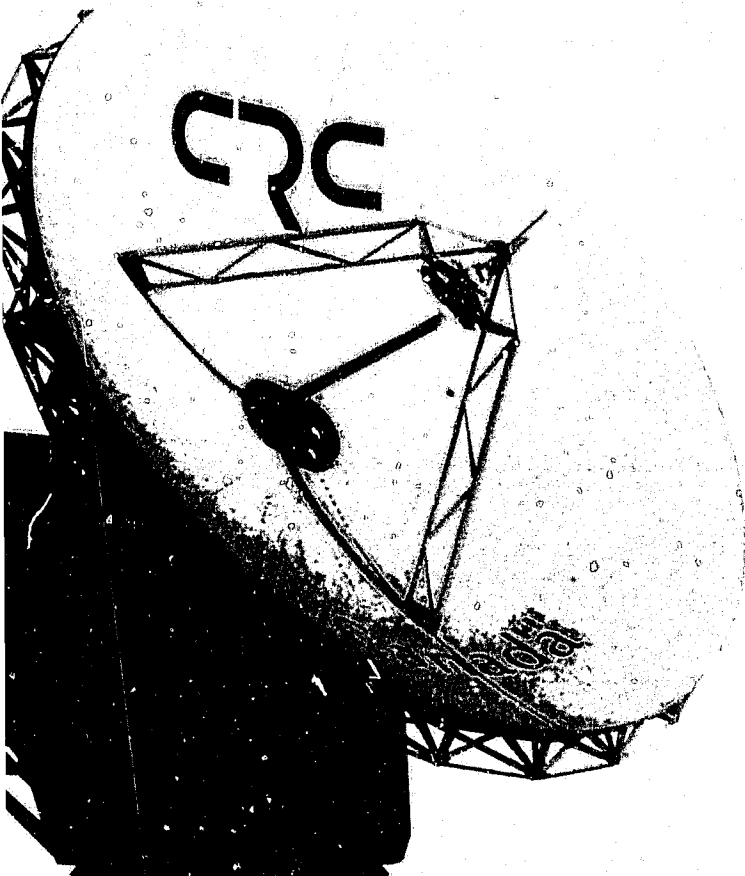
The demand for telecommunications equipment and services is exploding. Wireless communications, once a niche market, has become mainstream, with mobile communications growing by 30 percent annually. By the new millennium half of all North American telecommunications traffic could be wireless. In developing nations where public telephone infrastructure is lacking, wireless transmission will likely form the most cost-effective means of bringing voice and data communications to hundreds of millions of people.



In its 50 years of existence, tracing its roots back to the Defence Research Board in the late 1940s, the CRC has established an international reputation for engineering and science related to wireless communications. Founded on primary capabilities in ionospheric research, radio wave propagation, modulation and coding, CRC's R&D has historically been driven by applications in radio, satellite communications and broadcasting.

Recognizing its historical research strengths, CRC is marshalling the efforts of its core competencies and directing them toward one main business line:

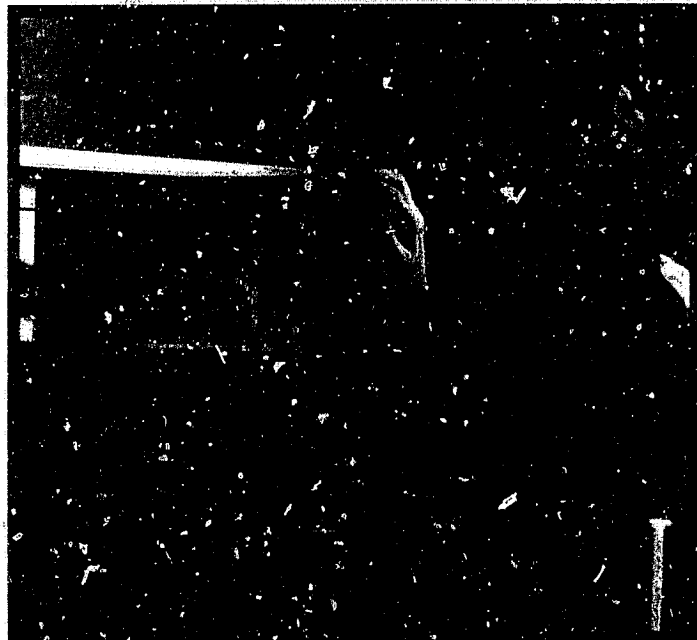
- **Wireless Communications R&D,**
supported by two associated activities:
- **Broadband Networking**
- **Applications Demonstrations**



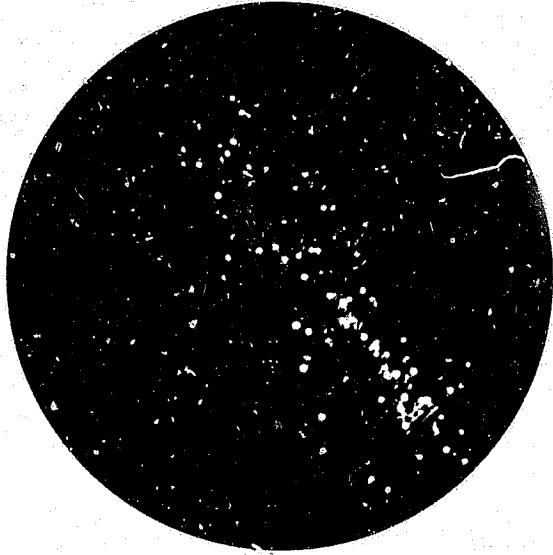
CRC's Place in Canada's National Innovation System

While long-term applied R&D is the foundation upon which CRC was built and continues to be the pipeline from which significant communications breakthroughs flow, the institute is focusing its R&D activities on a three-to-seven year time line for projects that show industrial promise. This complements the universities which have a much longer term research horizon and the private sector where a three-year R&D cycle is typical. The Communications Research Centre recognizes that it must strike a balance between long-term applied R&D which deals with basic problems of broad application and shorter term projects that have more immediate marketability and revenue generation potential.

CRC's impact in the national innovation system is enhanced through collaboration with complementary organizations.



Building R&D Alliances Across Canada



CRC is building partnerships with other R&D organizations across the country such as the National Research Council in Ottawa, TRILabs in Western Canada, the Telecom Applications Research Alliance in Nova Scotia, Communications and Information Technology Ontario, the Canadian Centre for Marine Communications in Newfoundland, and École Polytechnique in Québec. Through collaboration with these research institutes nation-wide, CRC is optimizing its resources.

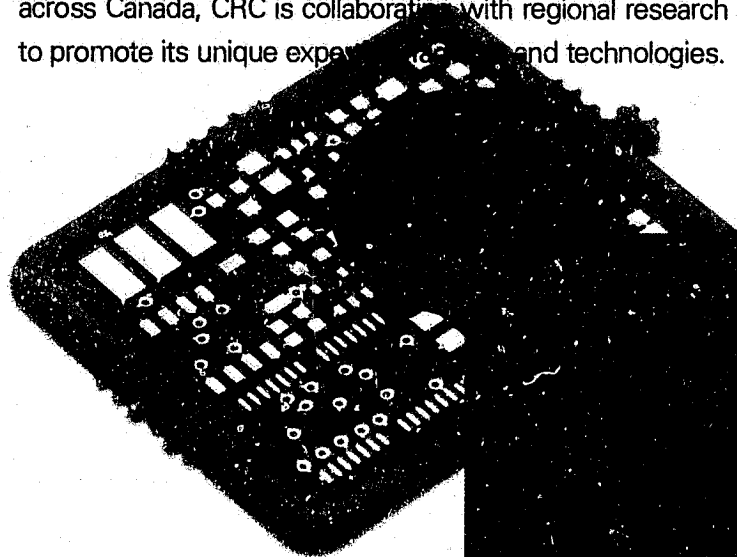


On-site Technology Incubation for SMEs

In 1994 the CRC Innovation Centre was created to offer qualified small companies temporary residency at CRC to access researchers and laboratories and to incubate promising technologies. More than 14 companies have been assisted and the list of companies wanting to locate on site is growing. Some firms reside for only a few months to take advantage of specialized labs or testbeds, while others have longer term projects that require several years of incubation. The CRC Innovation Centre has a flexible space-leasing program and fee structure that is based on optional services that are used by clients.

One of CRC's first clients, Linmor Technologies, won a new business of the year award from the Ottawa Carleton Board of Trade. Innovative Fibers, a company started by a former CRC researcher, has become a commercial success through the manufacture and sale of optical fibre gratings licenced from CRC.

To extend the CRC Innovation Centre's reach to potential clients across Canada, CRC is collaborating with regional research institutes to promote its unique expertise and technologies.



Watch-style emergency transmitter sets off a house alarm if the wearer falls into a swimming pool. The device was developed by CRC Innovation Centre client Square Peg Communications to protect children from drowning accidents.

Commercializing CRC's Technology

The Communications Research Centre has an enviable track record in technology transfer and 60 companies trace their lineage to technology or know-how they obtained from CRC on the road to commercial success in the private sector. CRC issues about 30 licences a year to companies for development of its intellectual property into communications components or products. The companies related to CRC have created thousands of jobs and generate almost a billion dollars in annual sales. The Institute works closely with its clients to ensure successful commercialization of CRC technologies.

CRC's Core Research Programs

Terrestrial Wireless Systems

CRC's terrestrial wireless R&D program investigates technologies and systems for reliable and robust fixed, mobile, and personal wireless communications. It is focusing on the emerging Local Multipoint Communications Systems (LMCS) and Personal Communications Services (PCS) technologies as well as military communications systems. CRC's extensive experience in the design and implementation of high speed digital integrated circuits and microwave and millimetrewave monolithic integrated circuits supports the integration of wireless and wire line systems. And to meet Industry Canada requirements, CRC is developing advanced radio techniques and tools for telecommunications and spectrum surveillance.

Radio Science, Antennas and Propagation

In the radio science field, CRC has the best concentration of subject experts in Canada. This program area studies and quantifies the physical limits to the reliability, quality and performance of radio systems. Areas covered include the effects of radio noise and interference on propagation, performance and radiating compatibility of antennas and electromagnetic compatibility. CRC also has the best team of experts in Canada in emerging technologies for the design of low profile microwave and millimetrewave antennas.

Satellite Communications Systems

From the launch of Canada's first satellite, the Alouette 1 in 1962, to MSAT in 1996, and the multimedia advanced satcom programs currently under development, CRC has managed and executed comprehensive R&D programs for Canada's satellite communications systems. The satellite communications program designs system concepts and develops key technologies and subsystems for both existing and planned satellite networks. CRC provides scientific guidance in planning industrial strategies for satellite communications under Canada's Long Term Space Plan.



Broadcast Technologies

CRC's broadcast technology R&D program focuses on digital television (DTV), digital radio broadcasting (DRB) and datacasting and the integration of these services into a broadband communications environment. The implementation of digital TV and radio services requires the resolution of many technical issues prior to new services being completely implemented in Canada.

Broadband Network Technologies

With rapid advances being made in the Information Highway, CRC created the Broadband Applications and Demonstration Laboratory (BADLAB) in 1994. The lab has become a key partner with the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) in developing broadband applications and demonstrations across Canada

and around the world. CRC is facilitating the integration of ATM into the Canadian Forces networks and is working with many of its NATO allies under the ACCORD Project.

Photonics and optoelectronics are the foundation of the new high-speed networks that represent the fast lane in the emerging Information Highway. CRC's award-winning and internationally recognized research in this field has generated numerous commercially valuable industrial fibre optic patents.



CRC's Internationally Recognized Researchers



The Team CRC is the Canadian government's leading communications research facility. With 200 research staff, CRC has exceptional talent and R&D expertise in a wide range of communications fields. Numerous researchers are internationally known in their respective disciplines. Many possess specialized scientific knowledge and skills that are unique in Canada. CRC's reputation for excellence is what prompts private companies, universities and other organizations from Canada and abroad to seek collaboration opportunities.



CRC's Internationally Recognized Facilities

The Communications Research Centre has more than 30 laboratories that are dedicated to the design, testing or evaluation of communications-related transmissions or devices. Here is a sampling of CRC's internationally acclaimed facilities.

Television Broadcast Technologies Laboratories

When developing new television standards for digital and high definition television, U.S. broadcasters come to CRC for its superb systems evaluation capabilities. The Grand Alliance, a consortium of U.S. companies, contracted CRC's expertise and facilities to complete subjective assessment tests for proposed high definition television standards. Chunghwa Telecom has contracted CRC's technical expertise to help plan and implement digital TV in Taiwan. Whether it is video compression techniques, channel characterization systems, HD or 3D TV, the Television Broadcast Laboratories help keep Canada at the forefront of developing and evaluating broadcast and video technologies.

Digital Audio Broadcasting

Since the mid-1980s CRC has been laying the technical groundwork for implementation of digital radio in Canada. CRC's expertise in standards evaluation has been internationally recognized by the broadcast industry and numerous companies have contracted its specialized services and expertise. The Electronic Industries Association and National Radio Systems are two of CRC's major clients which have conducted subjective assessment tests of proposed digital radio systems. CRC's Audio Perception Laboratory has been used by the biggest companies in the broadcasting industry because it is the premier facility in North America for accurately measuring and differentiating sound quality between competing systems.



Satcom Testbed

This unique testbed supports C, Ku and Ka band transmit/receive satellite communications systems and provides proof of concept testing, service development, and demonstrations to researchers, manufacturers, service providers, and users. Through an optical fibre connection with the BADLAB, this facility can support field trials which extend broadband communications capabilities using satellites.

BADLAB

The Broadband Applications and Demonstration Laboratory, BADLAB for short, was created to explore an emerging higher bandwidth standard known as asynchronous transfer mode (ATM),

that supports enriched interactive, multimedia communications. It has carried out numerous national and international demonstrations including HDTV over ATM with Japan's Communications Research Lab and Virtual Classroom with Switzerland's EXPERT Lab.

BADLAB was awarded a gold medal by Technology in Government for its partnership with the Ottawa Carleton Research Institute Network (OCRInet) in pursuing public service applications for broadband communications. The BADLAB concentrates on applications development and interoperability testing with its partners, which include, among others, Telesat Canada, Teleglobe Canada and NorthwesTel.

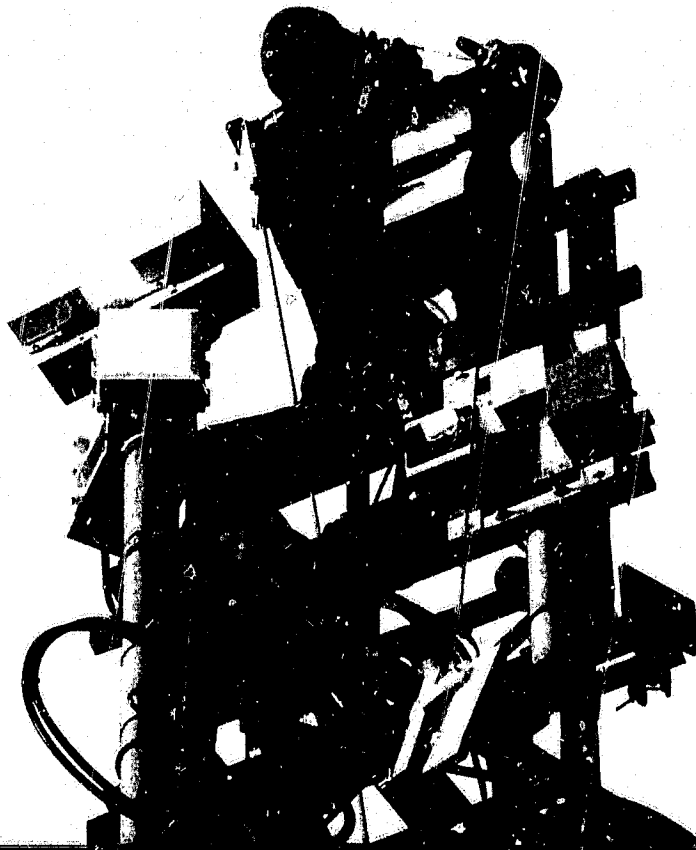
Defining the Wireless World

Distributed Broadband Wireless Testbed

CRC has created a Distributed Broadband Wireless Testbed to exploit R&D opportunities such as those arising from the licenses granted by Industry Canada for Local Multipoint Communications Services.

The testbed is a collaboration of the Ottawa Centre for Research and Innovation's OCRI-net and founding industry partners, WIC Connexus and Harris Farinon Canada. It is conducting research and development on wireless transmission of voice, video and data communications, plus interconnection with wired broadband networks.

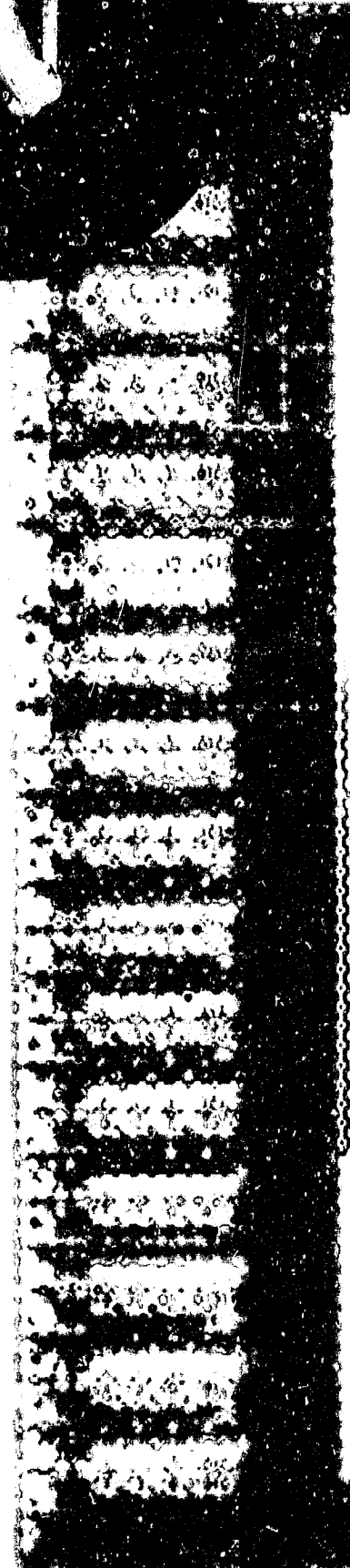
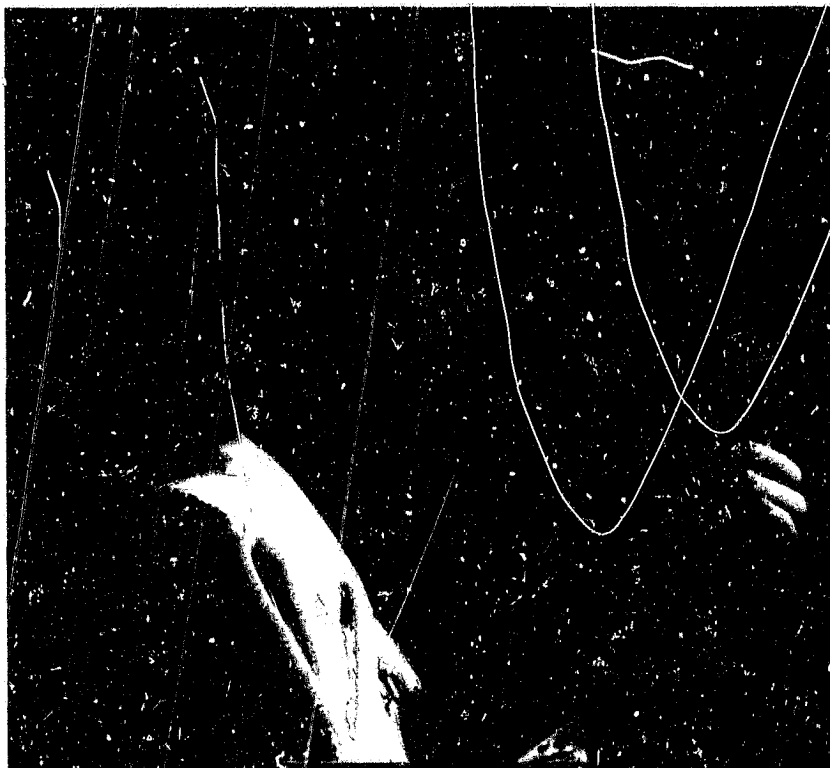
The wireless testbed is designed to provide private sector companies access for equipment evaluation, pilot projects and demonstrations.



Microelectronics and Antenna Laboratories

Microelectronics Lab

Meeting CRC's internal requirements for microelectronic devices has resulted in the development of laboratory facilities that are available to industry on a contract basis. The Microelectronics Lab has fabrication and assembly capabilities for customized high-speed optoelectronic, microwave and millimeterwave ICs. Coupled with the best design team in Canada for low profile antennas, CRC offers Canadian companies a consultation service and access to its state of the art near-field and anechoic chamber facilities for the evaluation of microwave and millimetrewave antennas. Nanowave Technologies, Nortel, Telepanel, and Lockheed-Martin are a few of the companies that have sought CRC's expertise and laboratory facilities.

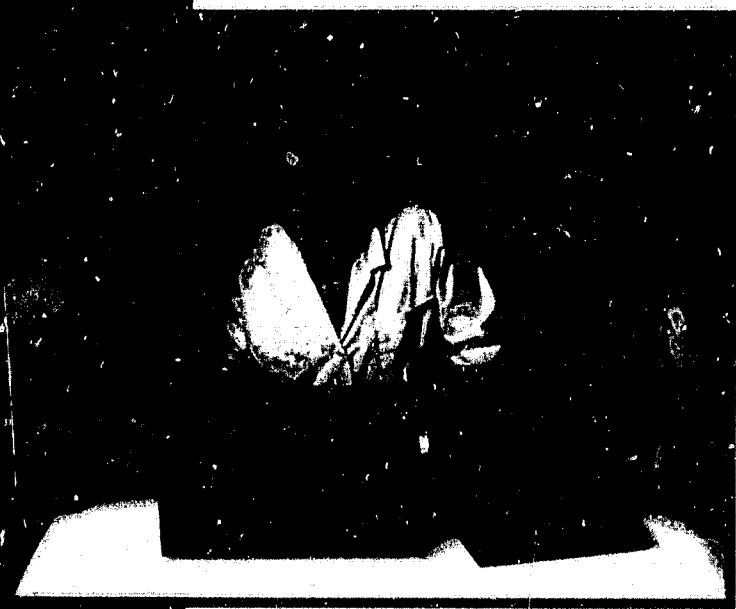


Wavelength Division Multiplexing [WDM]

As the Information Highway expands and requires greater bandwidth to carry the traffic, fibre optic solutions are being sought. Research is under way to exploit photonics in the area of high bandwidth, high data rate networks from components to sub-systems.

CRC is developing a wavelength division multiplexing link to evaluate the interoperability between photonics, wireless and broadband communications systems.

CRC, in partnership with Nortel, École Polytechnique, the University of British Columbia and Queen's University, is studying WDM, connecting with other technologies, to provide potential bandwidth solutions.



For more information on business opportunities or research programs at CRC phone: (3) 998-4287 or visit CRC's web site:

<http://www.crc.gc.ca>

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