

DEFENCE **R&D** DÉFENSE

Canadian R&D Program in Laser Detection and Countermeasures

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Canada

Outline

- Laser threats
- Laser detection phenomenology
- Laser warning receivers (LWR)
- DRDC work in laser detection
- Countermeasures & integration
- Conclusion

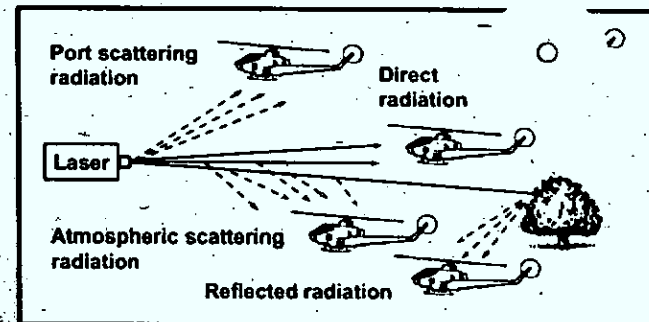
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Laser threats on the battlefield

- Laser Designators (High power/Medium PRF)
- Laser Beam Riders (Low power/High PRF)
- Laser Range Finders (High power/Low PRF)

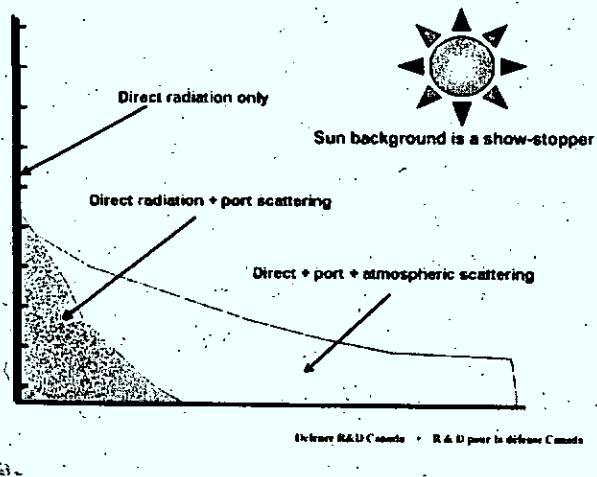
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Detection mechanisms



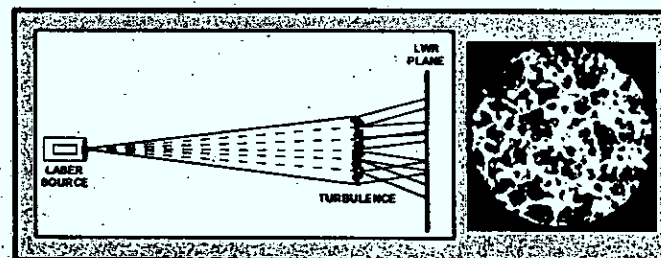
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Laser source off-axis signature



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Atmospheric scintillation



- Cold and hot spots
- Wide dynamic range required

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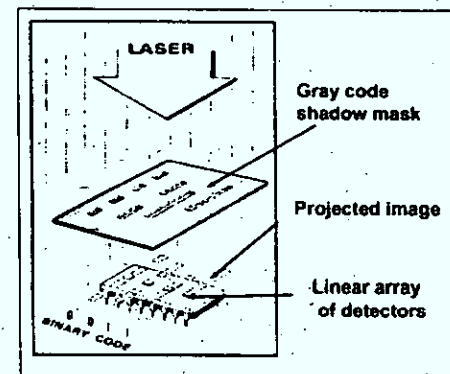
LWR specifications

- High probability of detection
- Low false alarm rate
- Wide dynamic range
- Threat identification
- Wide wavelength coverage
- High angular resolution for directed CM
- Adapted to the type of platform
- Integration in global protection suite

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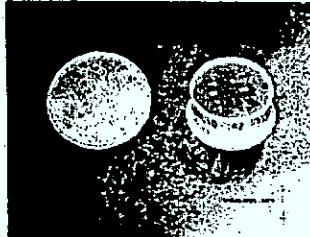
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DRDC High Angular Resolution Laser Irradiation Detector (HARLID)



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Digital HARLID Module

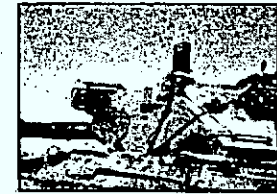
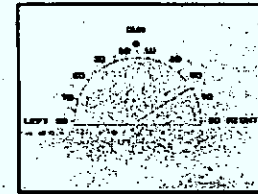


Technology
licensed to
Perkin Elmer
Optoelectronics
Montreal

High angular resolution:	0.8 degree
Wide spectral band:	400 to 1600 nm
Large dynamic range:	60 dB optical
Rugged:	Shock/temp/accel./vibration
Field of view:	+46 to - 46 degrees

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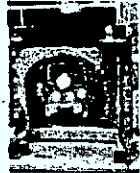
HARLID-based LWR



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BRILLIANT

Beam Rider Laser Localization Imaging And Neutralization Tracker



LBR guidance
beam



Imaged LBR source



Laser CM
beam

Laser dazzle



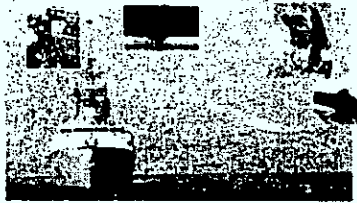
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Countermeasures

- Dependent on platform
- Dependent on LWR angular resolution
- Evasive manoeuvres
- Counter firing
- Smoke deployment
- Dazzle & jamming
- Others

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LOCATES – Laser Optical Countermeasures Against Threat Environment



- Objectives
 - Develop and demonstrate a laser/optical surveillance and CM system to detect, locate and defeat laser-assisted threats in harbor and littoral environment and to detect & locate sight/optics
- Technologies
 - Laser retro-reflection surveillance (GLARES)
 - Ultra-sensitive laser detection, tracking and CM (BRILLIANT)
 - Far off-axis laser detection system (LASSOS)

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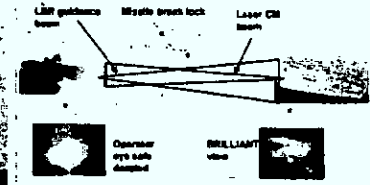
LOCATES – Technologies Involved

GLARES
(retro-reflection)

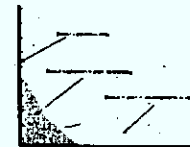
GLARES in Maritime Surveillance Application



BRILLIANT
(against IIR)



LASSOS
(against IIR)

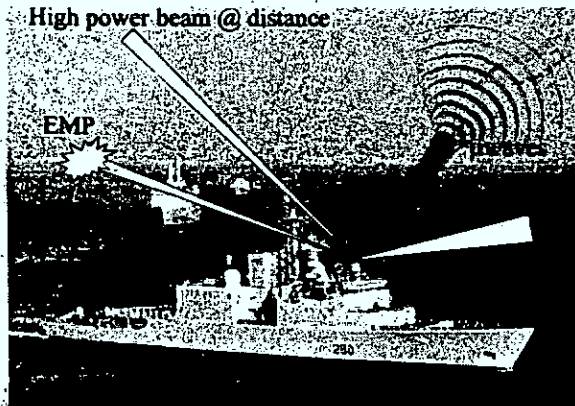


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Advanced CM possibilities based on femtosecond TW laser

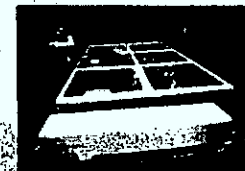
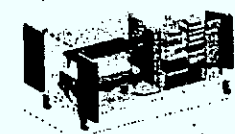
High power beam @ distance



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DRDC Terawatt (TW) Femtosecond Mobile Laboratory

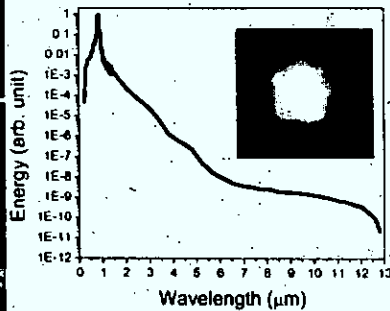


- Special properties of TW femtolaser
 - Auto-focusing
 - Filamentation
 - White light generation (UV to IR)
 - Atmospheric ionization
- Military applications
 - E-O CMs (dazzle, optics damage...)
 - Energy guidance CMs

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Wideband dazdling

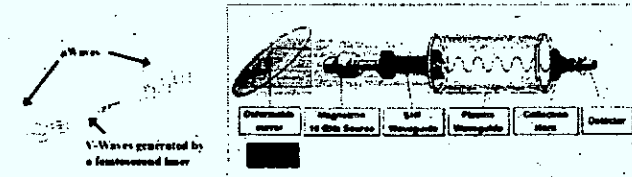


Generation of a supercontinuum
of white light in air

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Plasma-Induced Virtual Waveguide for Microwaves, (V-Wave)



Objectives

- Investigate the possibility of guiding microwave through air using femto laser ionized channels
- Demonstrate the propagation of microwaves within the V-Wave in the lab and in the field
- Evaluate the potential of V-Wave as CM.

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Conclusion

- DRDC is very active in the domain of laser detection and CM from sensors to systems
- Laser threats on the battlefield are there to stay and are difficult to timely detect & defeat
- High angular resolution is highly desirable for CM delivery (especially for directed CM)
- A whole variety of laser CMs are possible and some can be combined with RF CM to create synergy

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Questions ?

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