INCT SEMICONDUCTOR NANODEVICES

www.disse.org.br

Members

PUC-Rio
Patrícia Lustoza de Souza
Bruno Horta
Ivan Guillermo Solórzano

UFRJ
Maurício Pamplona Pires

UFMG
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Franklin Massami Matinaga
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USP
Alain André Quivy
Euzi Conceição Fernandes da Silva

CTEx
Adenir da Silva Filho
Leonardo Bruno de Sá
Marcelo Silva Bortolini de Castro

IEAv
Ademar Muraro Jr
Angelo Passaro
Gustavo Soares Vieira
Nancy Mieko Abe
Ruy Morgado de Castro

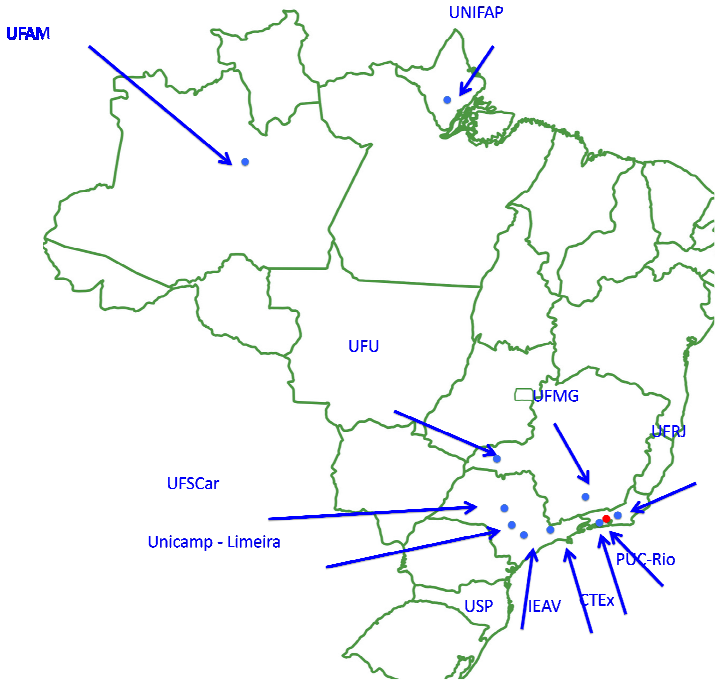
UFSCar
Nelson Studart
Paulo Eduardo Farinas

UFAM
Eduardo Adriano Cotta

UNIFAP
Henrique Fonseca Filho
Robert Ronald Maguinã Zamora

UNICAMP - LIMEIRA
Marcos Henrique Degani
Marcelo Zoéga Maialle

UFU
José Maria Villas Boas



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Management Board

The members of the management board are:

Patrícia Lustoza de Souza	PUC-Rio
Paulo Sérgio Soares Guimarães	UFMG
Gustavo Soares Vieira	IEAv
Maurício Pamplona Pires	UFRJ
Nelson Studart	UFSCar

The members responsible for the different missions are:

Paulo Sérgio Soares Guimarães	UFMG	*Basic research*
Patrícia Lustoza de Souza	PUC-Rio	*Technological research*
Wagner Nunes Rodrigues	UFMG	*Education/training*
Nelson Studart	UFSCar	*Transfer of knowledge to society/outreach*
Gustavo Soares Vieira	IEAv	*Transfer of knowledge to industry and government*

Research net procedures

Home-page (www.disse.org.br)

Intranet

Skype

Facebook

Twitter

YouTube

Newsletter

Scientific visits

Periodic small groups meetings

Annual workshops

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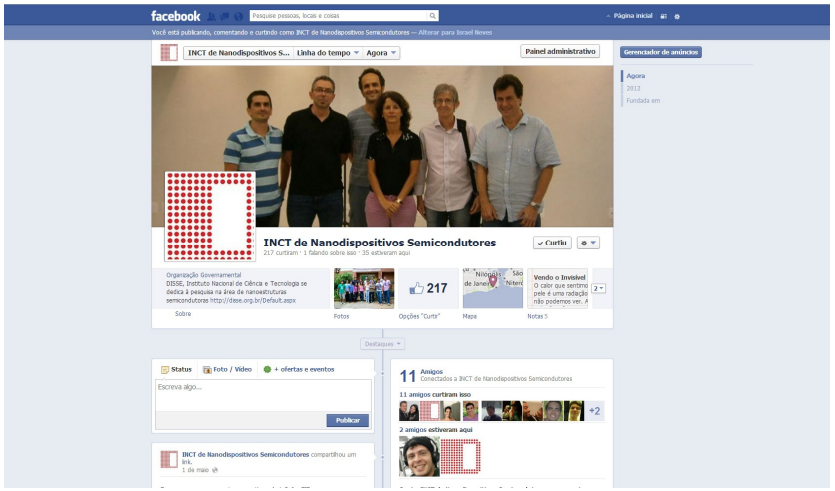
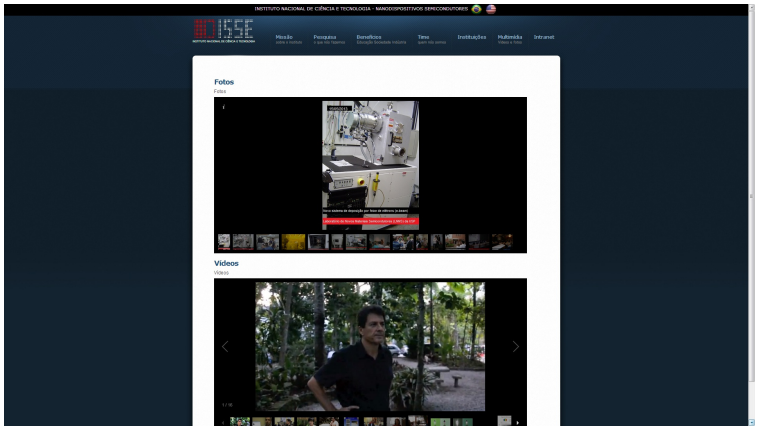
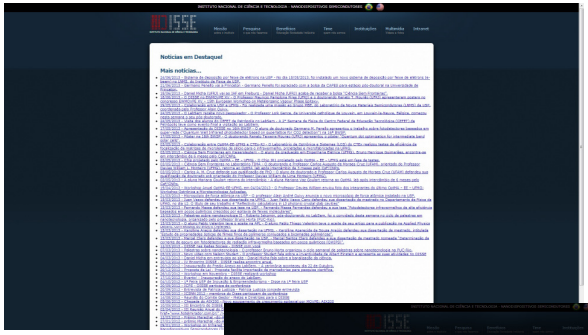
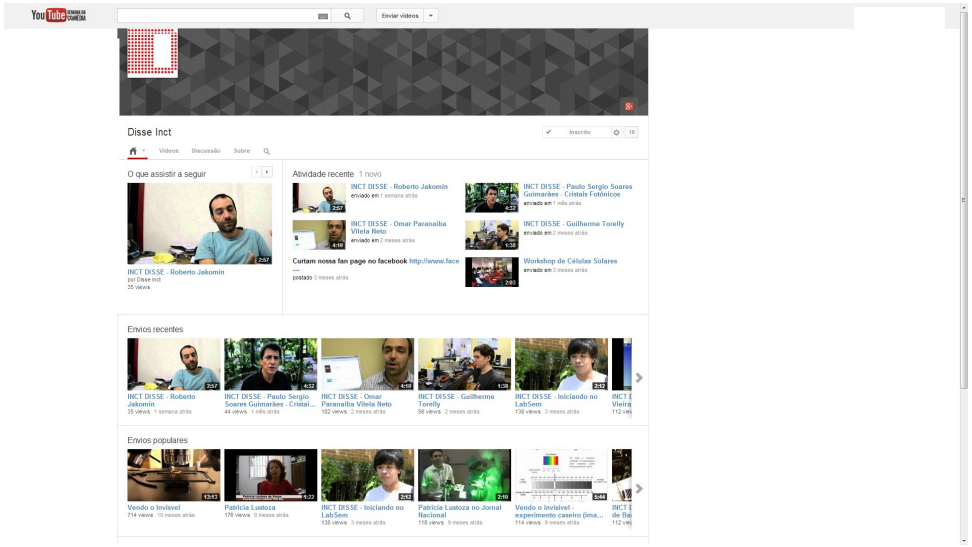
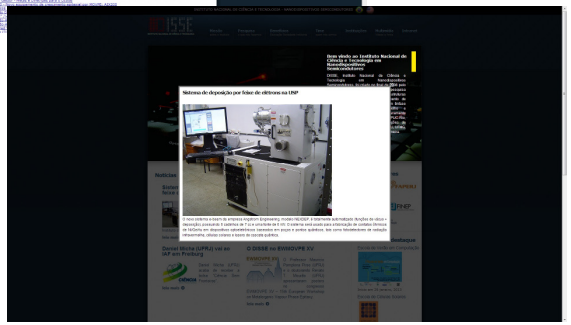
Research net procedures











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Research net procedures

Milestones planning

Aims were annually reviewed based on the reports presented at the annual meetings

Use of financial resources:

General lines decided in an extended meeting of the group

Priority for:

- **far-reaching equipment avoiding duplicity when possible**
- infrastructure for emerging groups with little resources
- **expensive equipment which cannot be acquired with resources from regular projects**
- replacement or services on broken equipment which requires fast availability

Research net procedures

Search for other financial sources was constantly stimulated.

The group doubled the resources available through local projects financed by FINEP, CNPq, Faperj, Fapemig, Fapesp and CAPES

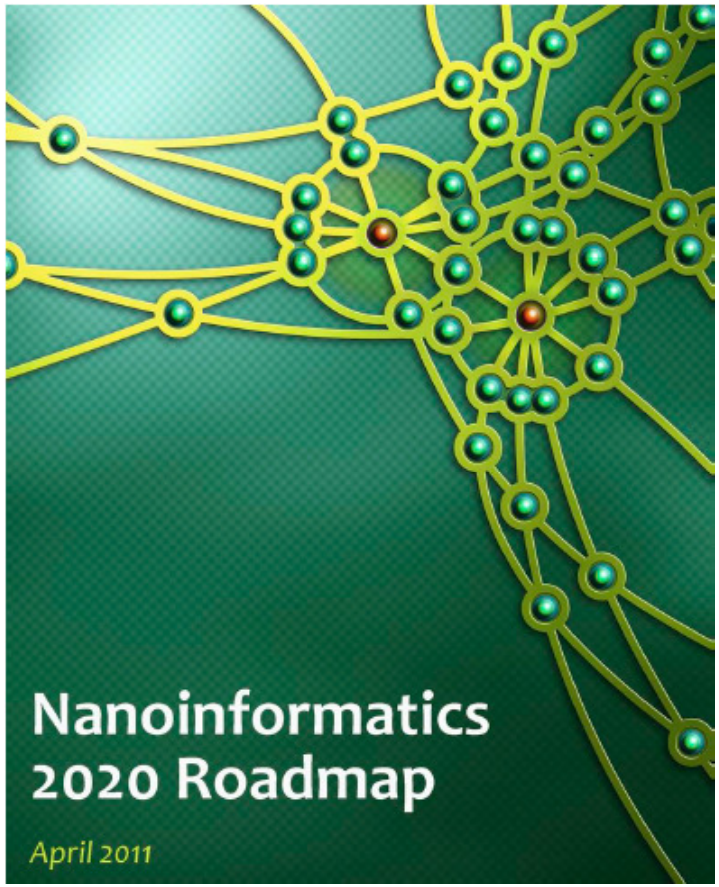
Mechanisms for implementing the resources transfer to the members

- Each group leader within the INCT had a grant for daily expenses that did not need to be analysed by the management board
- **Simple and fast for national expenses: demands are directly sent to the management board which replies promptly with final decision**
- Very difficult and time consuming to import goods for the member institutions

Nanoinformatics

Nanoinformatics is the **science and practice of determining which information is relevant to the nanoscale science**, developing and implementing effective mechanisms for collecting, validating, storing, sharing, analyzing and applying the information.

Applied Computational Methods: Computational Intelligence, Optimization, Data Mining & Machine Learning.



http://www.internano.org/nanoinformatics/

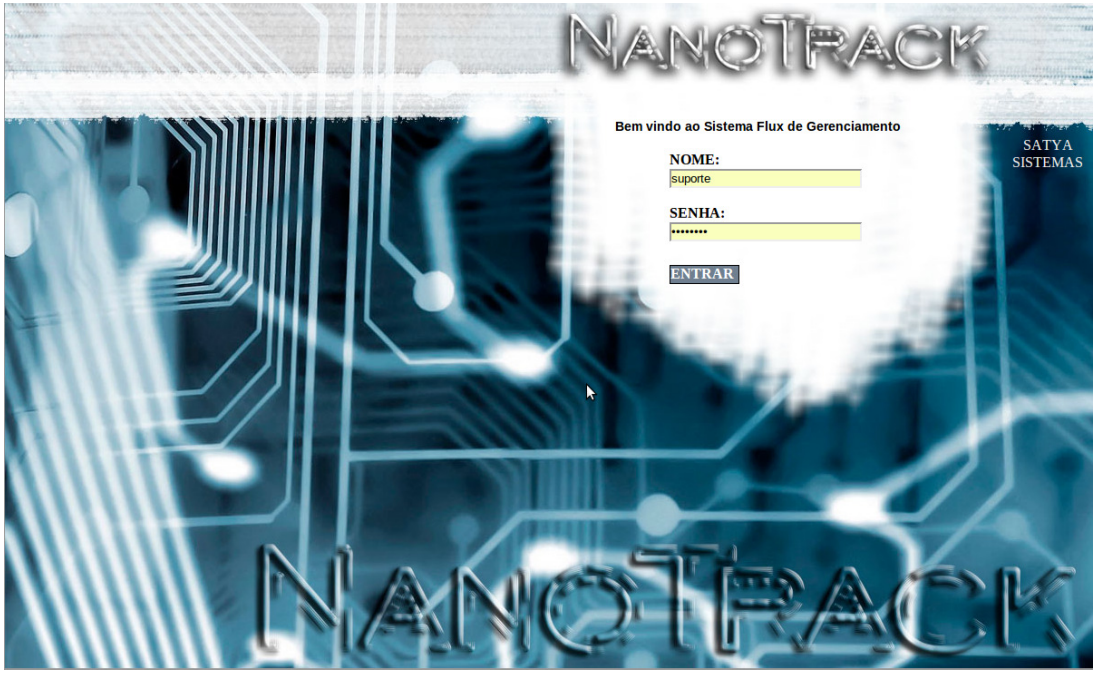
Nanoinformatics

LIMS

"A *Laboratory Information Management System* (LIMS) is a **computational system** applied in the laboratory for administration of samples, standards, experiments, users, tools, materials, protocols and **automate procedures**".

Nanoinformatics

NanoTrack: an **intelligent LIMS** developed for DISSE



Vilela Neto et al CSBC 2012

Developed by:

nanocomp LABORATÓRIO DCC - UFMG

UFMG - ICEx DEPARTAMENTO DE CIÊNCIA DA COMPUTAÇÃO

LUAR Laboratório de Universalização de Acesso UFMG

Lecom

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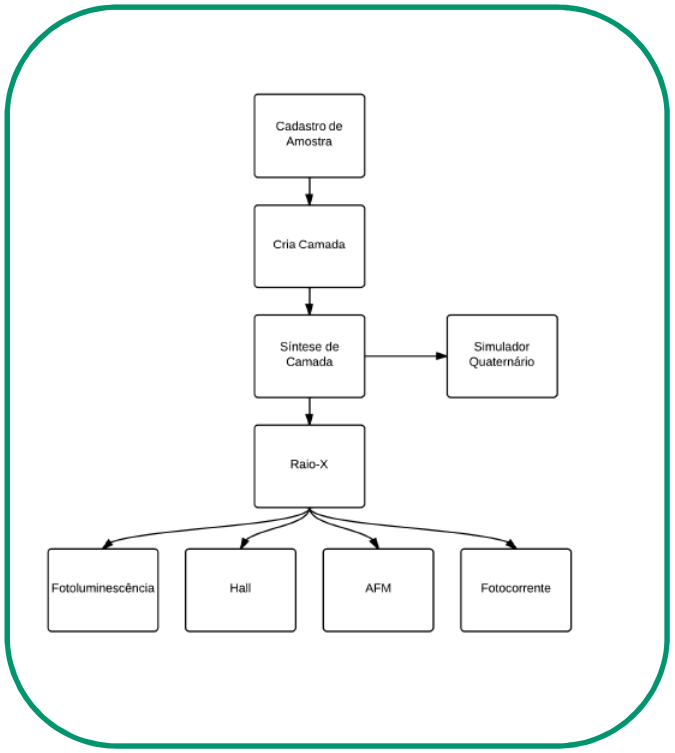
DISSE

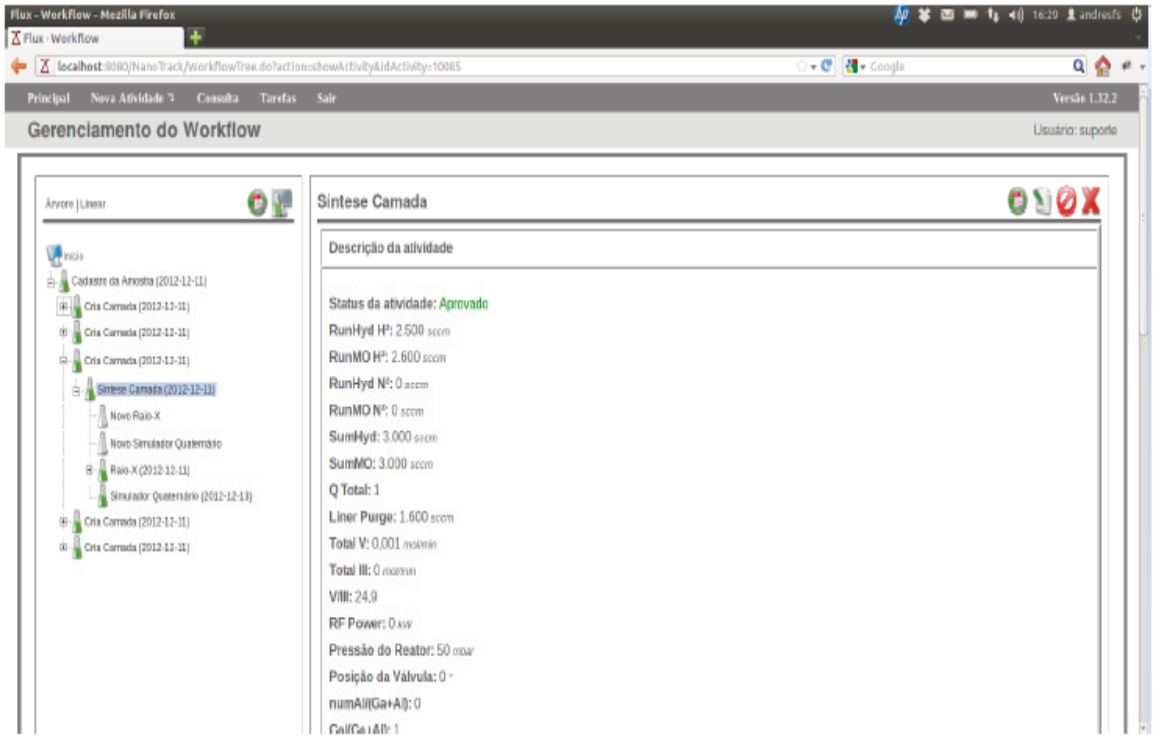
Nanoinformatics

LABSEM

Workflow



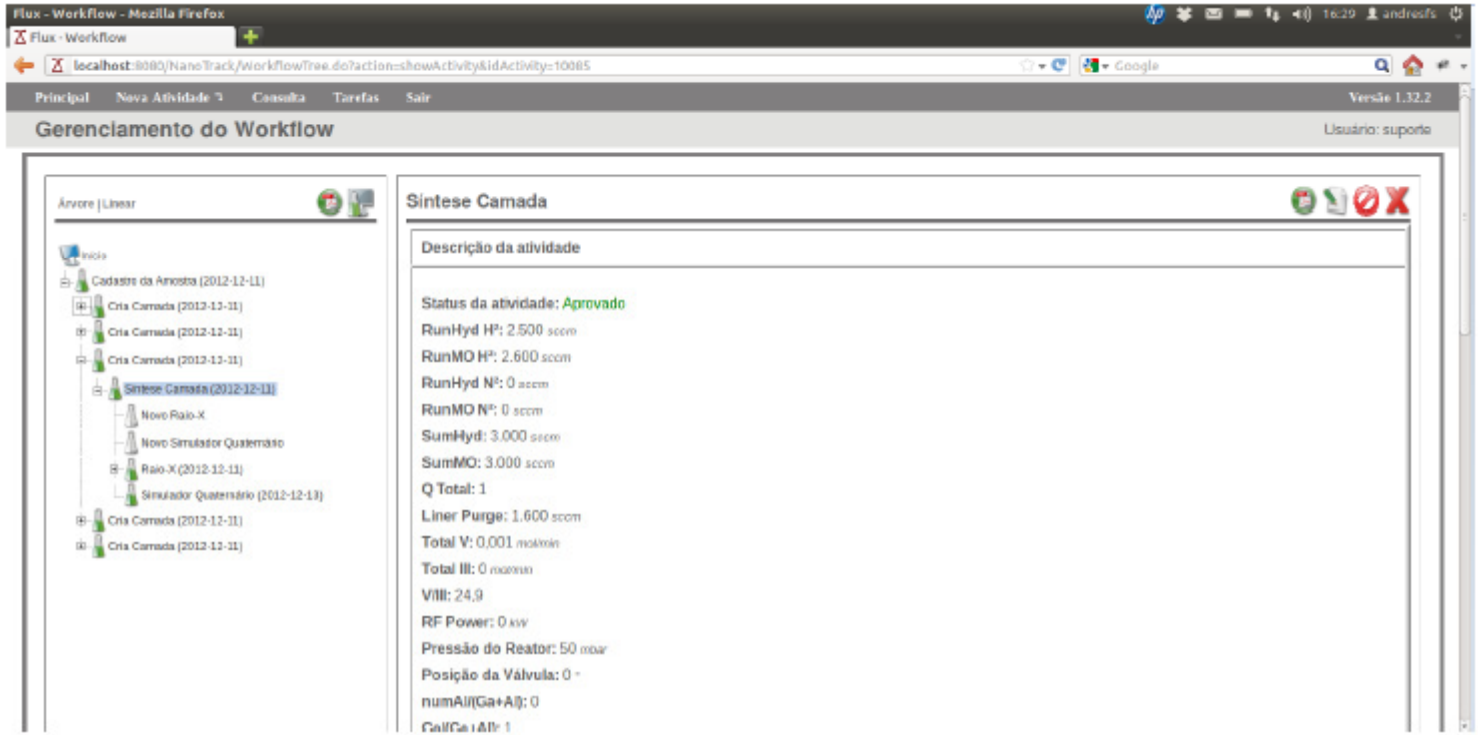
DISSE information in the NanoTrack system.



INSTITUTO NACIONAL DE CIÊNCIA E TECNOLOGIA
NANODISPOSITIVOS SEMICONDUTORES

Nanoinformatics

DISSE information in the NanoTrack system.



Aims

Consolidation of the epitaxial growth center within the institute

Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

Development of solar cells based on nanostructures

The group insertion in the international scenario with the development of novel semiconductor nanodevices

Undergraduate and graduate education in the field with both scientific and industrial profile

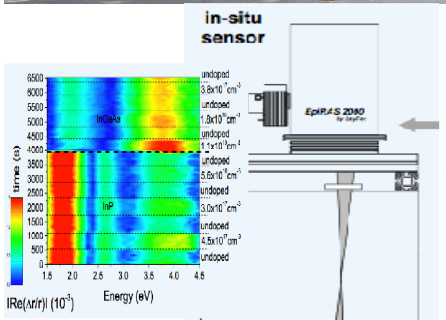
Technical training

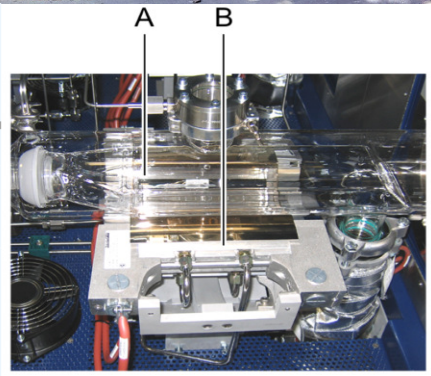
Create conditions for the development of spin-offs

Supplying photodetectors for industry and government offices

Out-reaching actions on the field of research of the institute

Consolidation of the epitaxial growth center



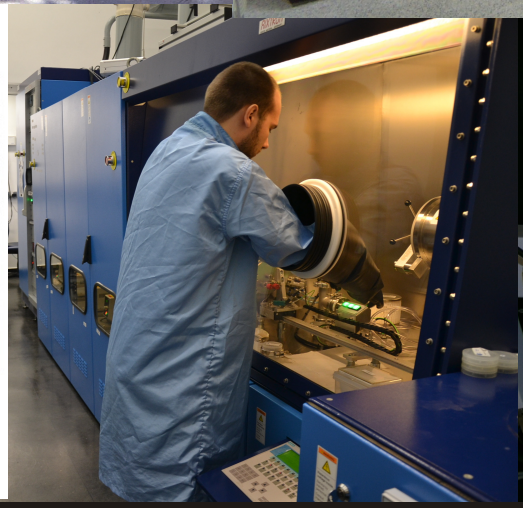


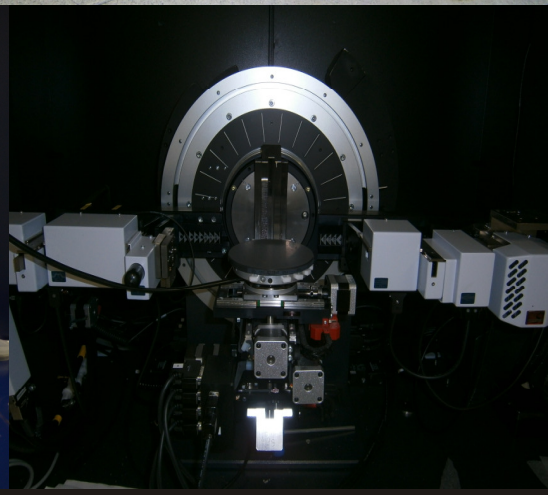
Infrared heater

A Reactor

B Infrared lamp

Mourão et al
EWMOVPE, 2013





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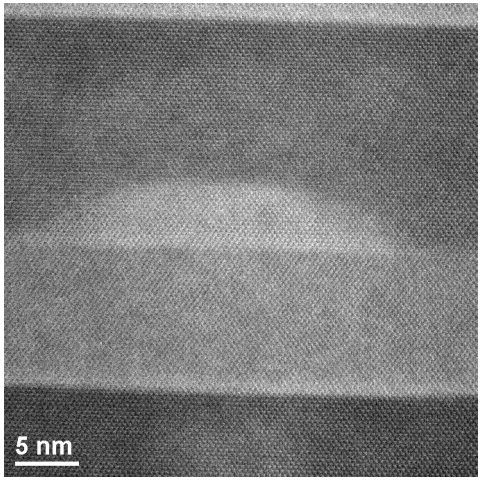
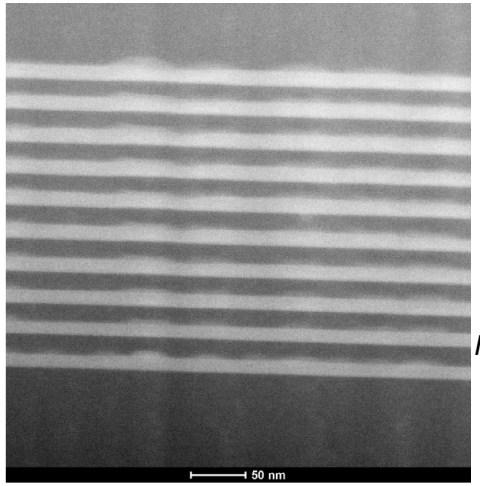
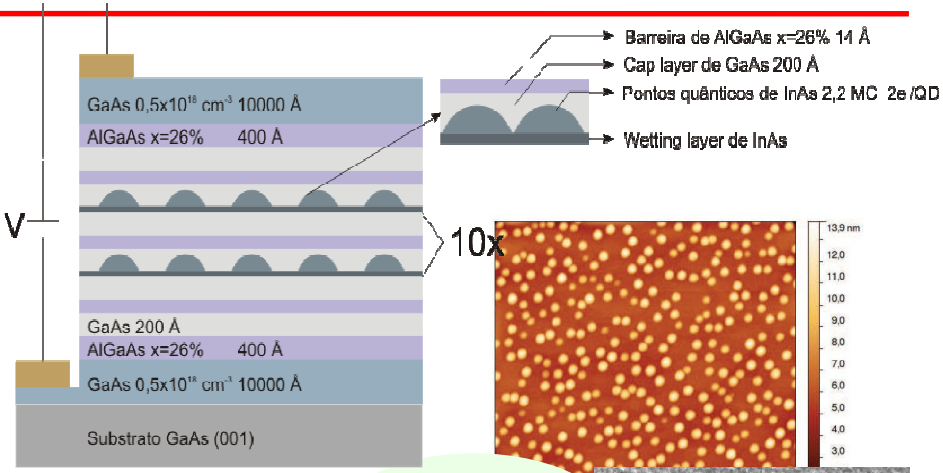
Epitaxial growth of nanostructures

Structures containing quantum dots for QDIPs and tunneling experiments



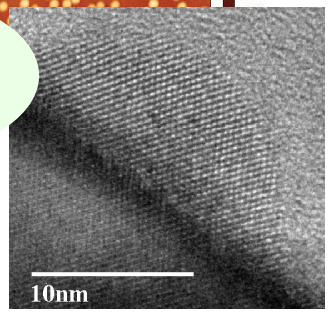


Sandra Landi, collaboration with INMETRO

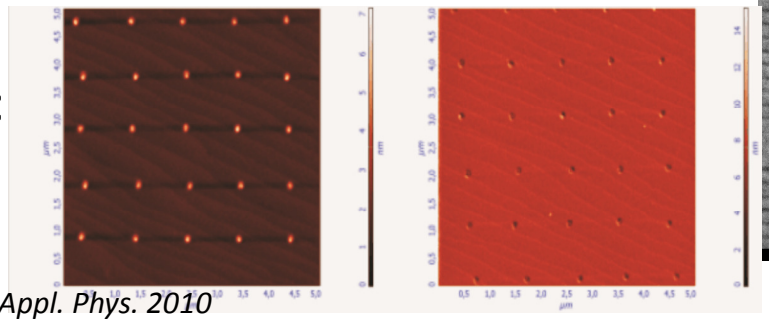


InAs/GaAs

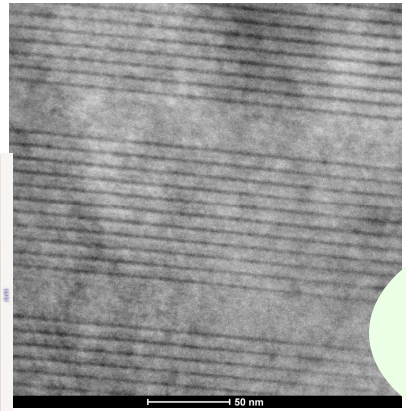
Keizer et al Appl. Phys. Lett. 2012



Site control quantum dot nucleation by AFM



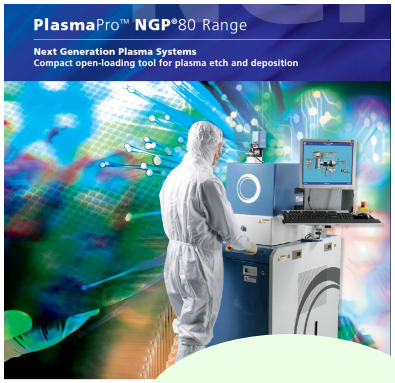
Fonseca Filho at al J. Appl. Phys. 2010



GaAs/AlGaAs superlattices for QWIPs

Penello et al, IEEE J. Quantum Electronics in print

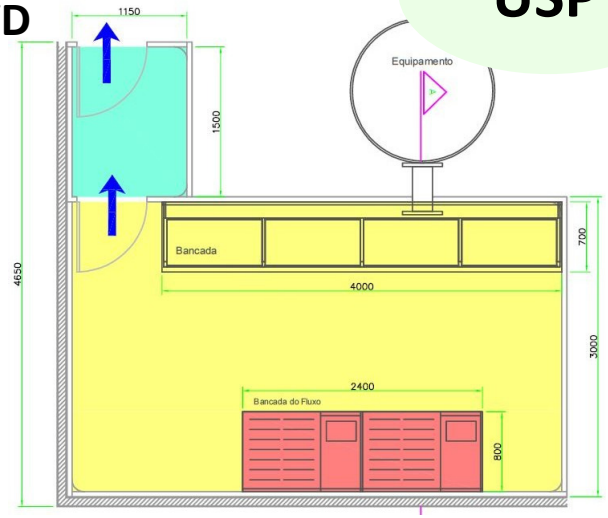
Device fabrication

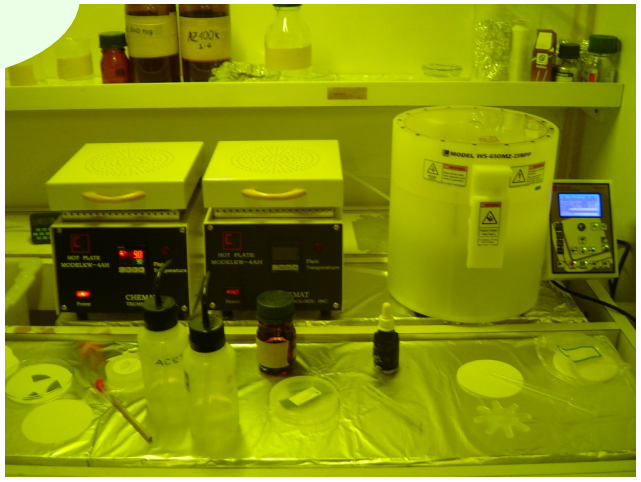


RIE and CVD

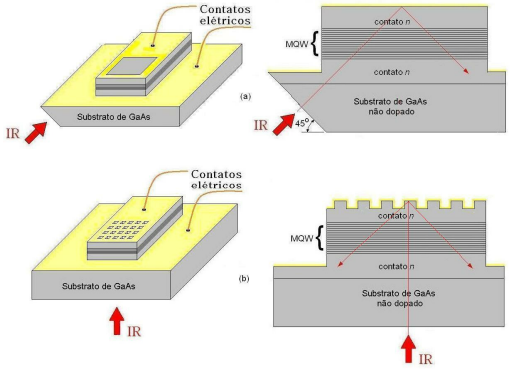
UFMG

USP

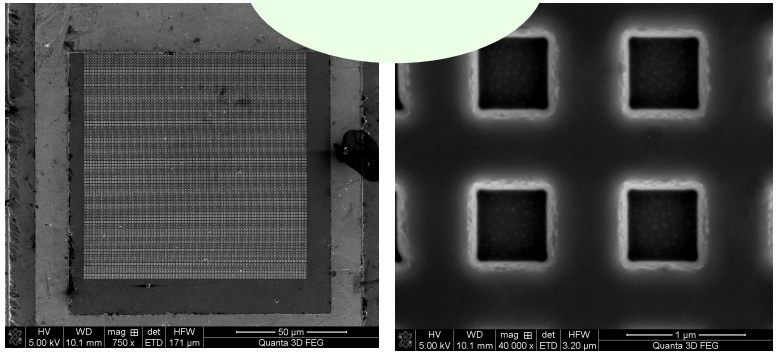




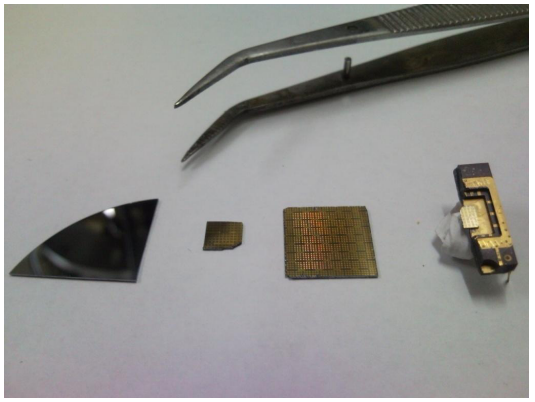
Gratings



UFMG



Processing steps



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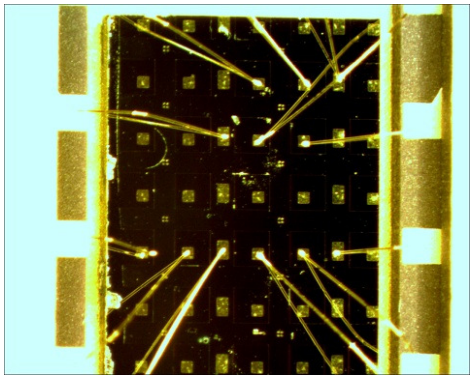
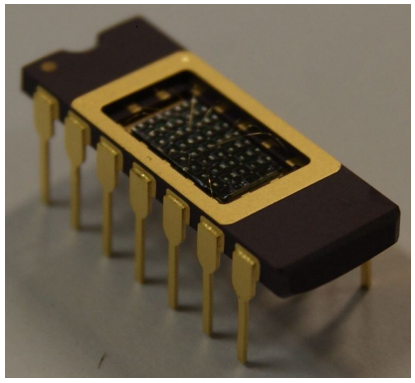
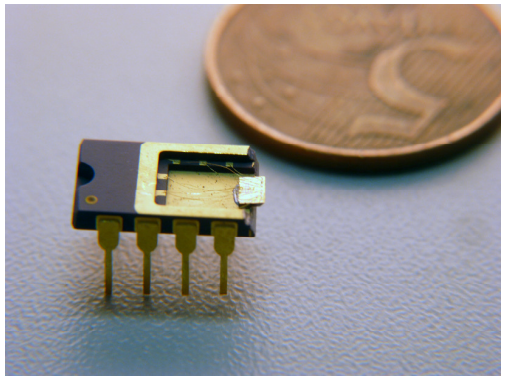
Device fabrication

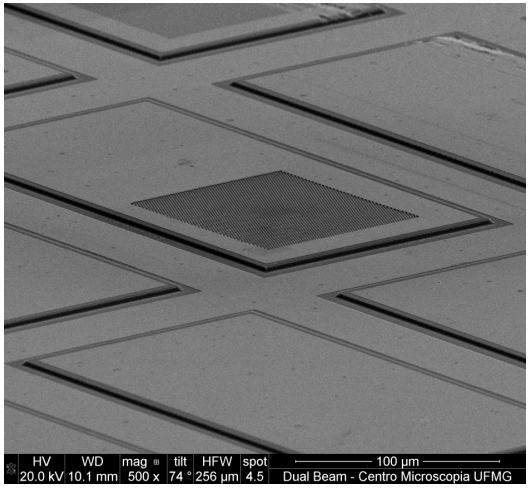
Final devices

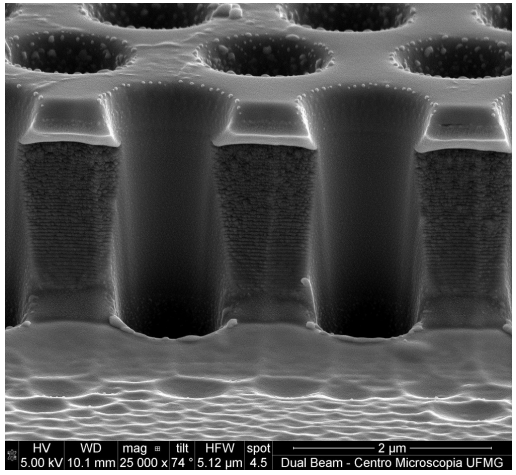




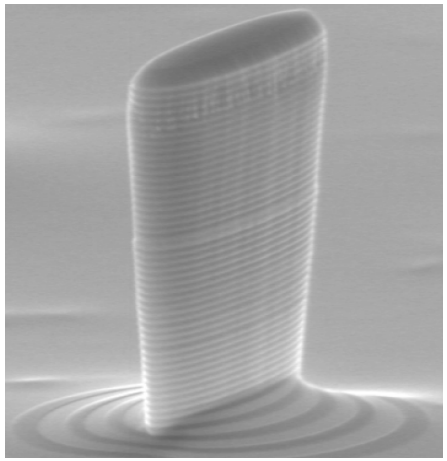


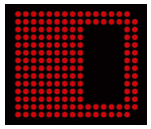
Photonic crystals





Pillars





Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

Four parallel tracks were followed:

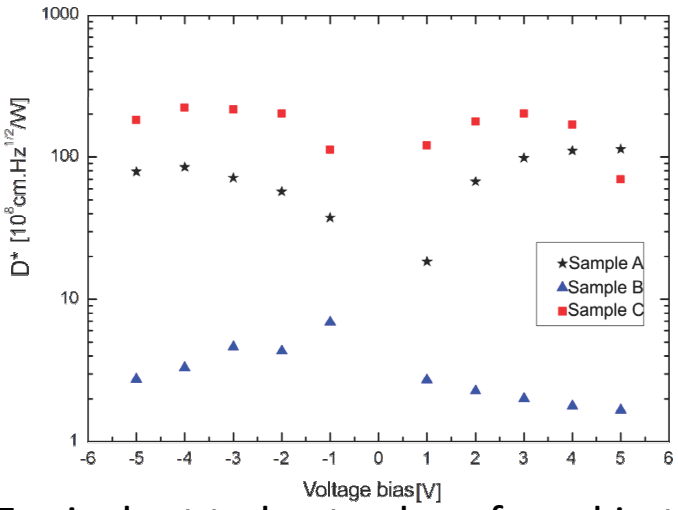
- Production of different photodetectors
- **Understanding of the physical mechanisms involved in current generation and collection**
- Development of the required circuitry for the read-outs of the photodetectors
- **Design and fabrication of equipment which uses photodetection for relevant applications**

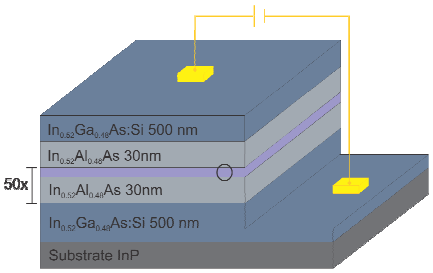
Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

Production of photodetectors for operation at different wavelengths

Quantum well infrared photodetectors - QWIPs

InGaAs/InAlAs QWIP

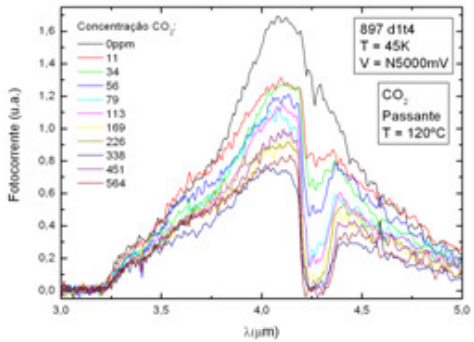


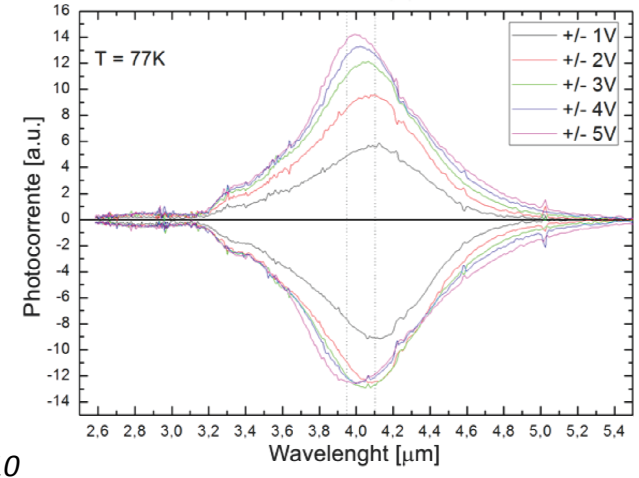


Equivalent to best values found in the literature

Figueroa et al, SBMicro 2013 accepted
Figueroa et al, BWSP 2013

CO_2 sensing



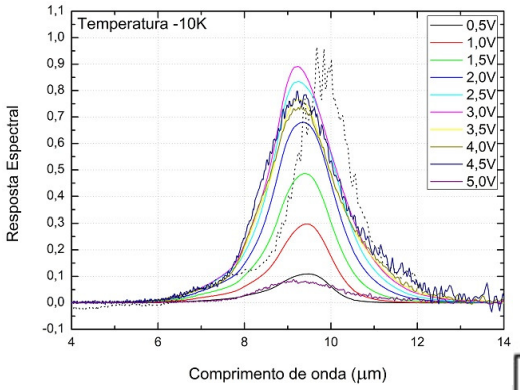


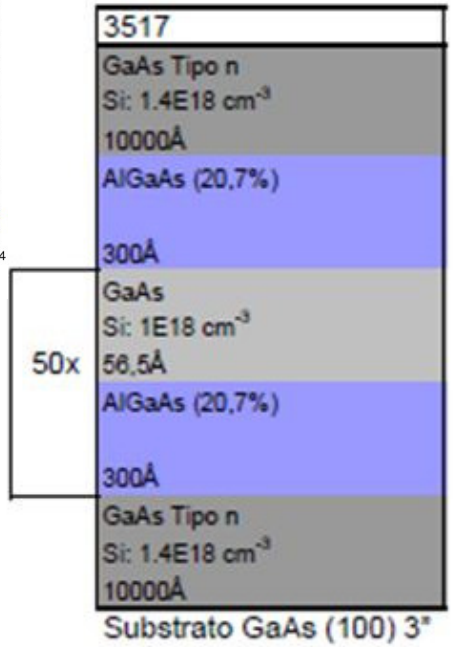
Micha et al, ENMC 2010
Micha et al, BWSP 2011

Production of different photodetectors

Quantum well infrared photodetectors - QWIPs

GaAs/AlGaAs QWIPs

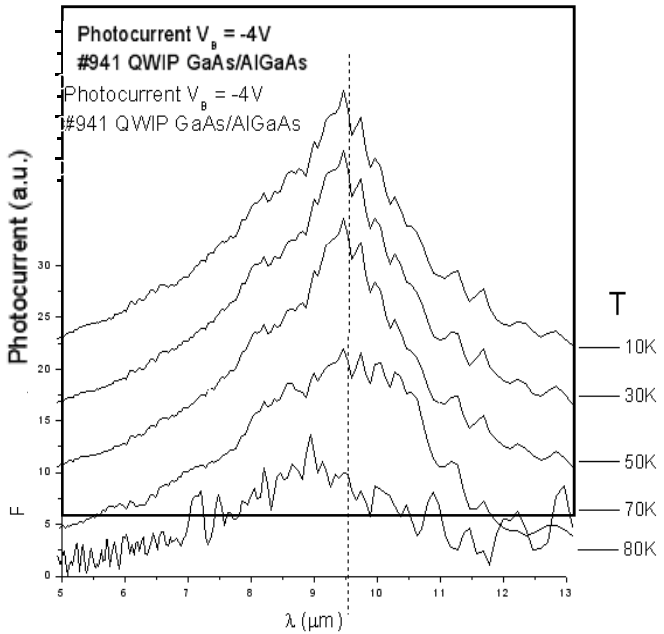




NO_x and methane sensing

Fernandes et al , ICSNN 2012

Free space communication or 300 K imaging

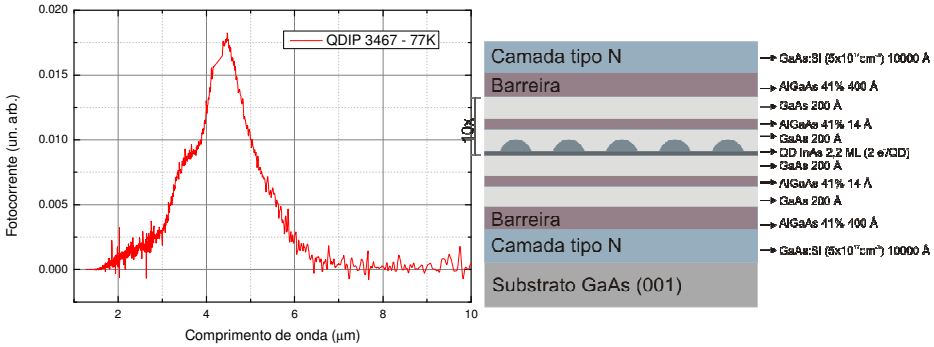


Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

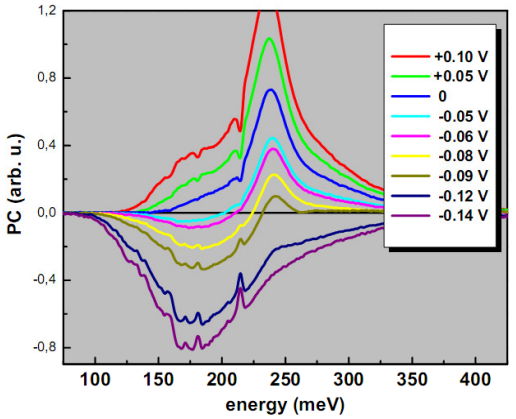
Quantum dot infrared photodetectors

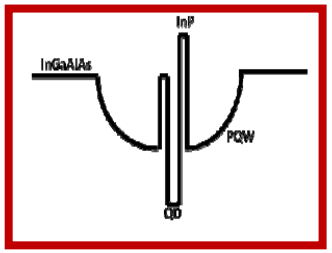
Maia et al, ICSNN 2012,
Maia et al, J. Appl. Phys. to be published

CO_2 sensing



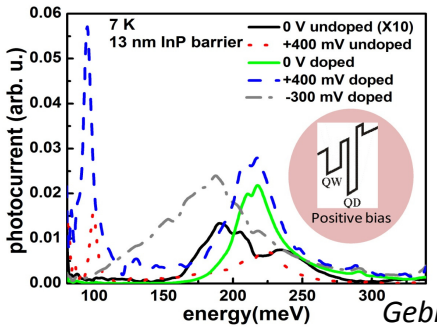
Two color detector

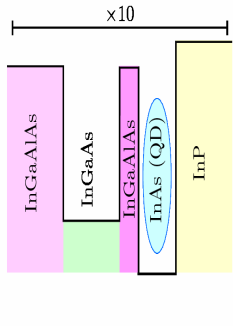




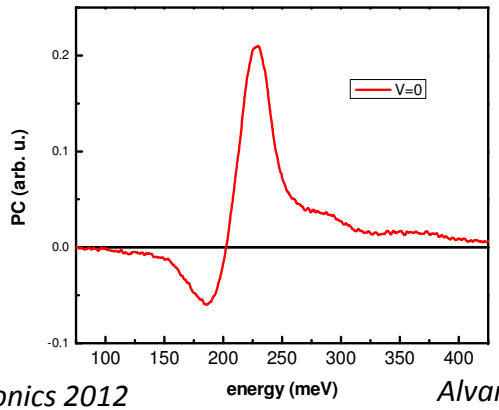
Penello et al BWSP. 2009

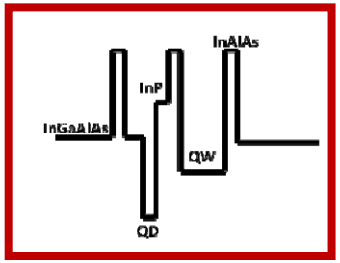
Record value of FWHM for fine wavelength discrimination





Gebhard et al J Modern Physics 2009
Gebhard et al LEOS 2009
Alvarenga et al IEEE Quantum Electronics 2012

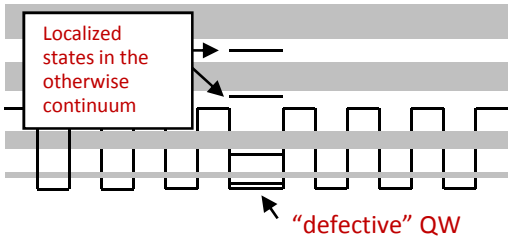




Alvarenga et al J. Appl. Phys. 2013

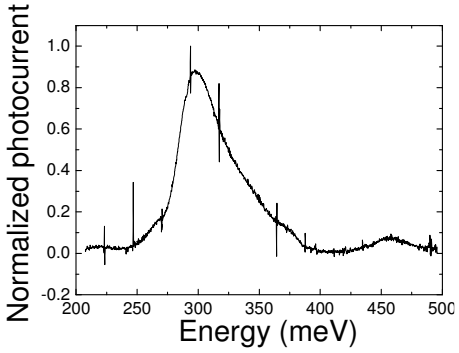
Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

QWIPs based on superlattices



InP / InGaAs / InAlAs heterostructure

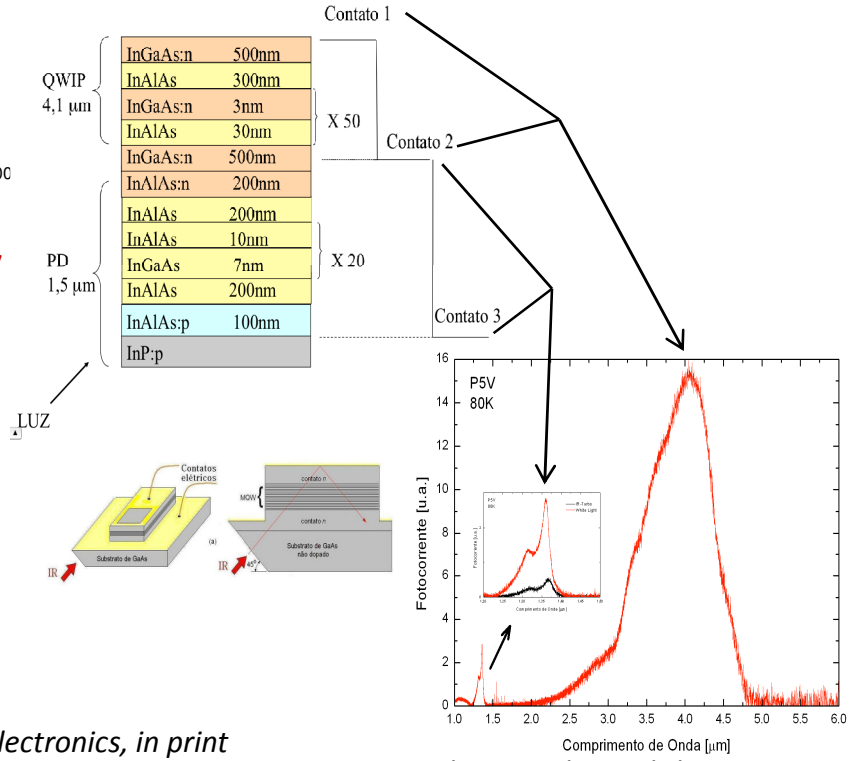
- Increase transition energy
- High selectivity
- Easy carrier extraction
- Tunability not limited by bandoffset
- Low thermal excitation



- **FWHM = 48 meV**
- **$\Delta\lambda/\lambda$ = 15%**

Penello et al IEEE Quantum Electronics, in print

Two coupled devices for two colors detection



Kawabata et al , Workshop IRT, 2010

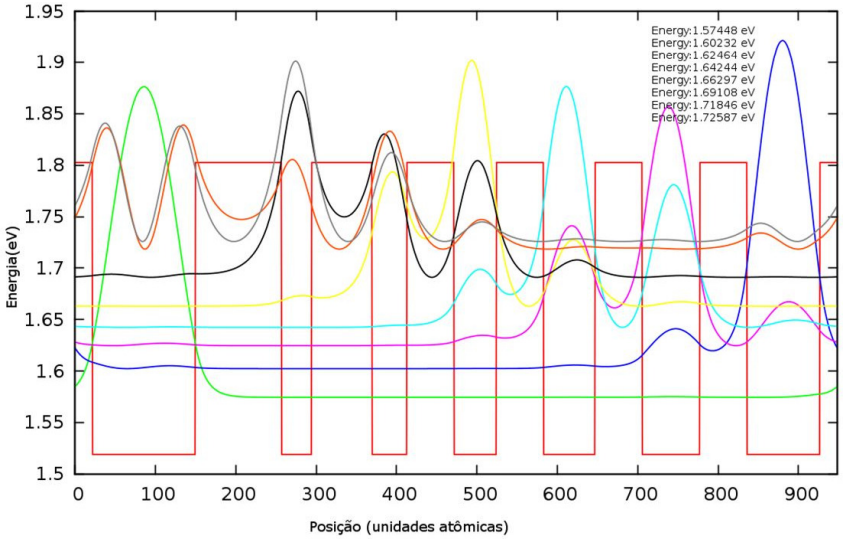
Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

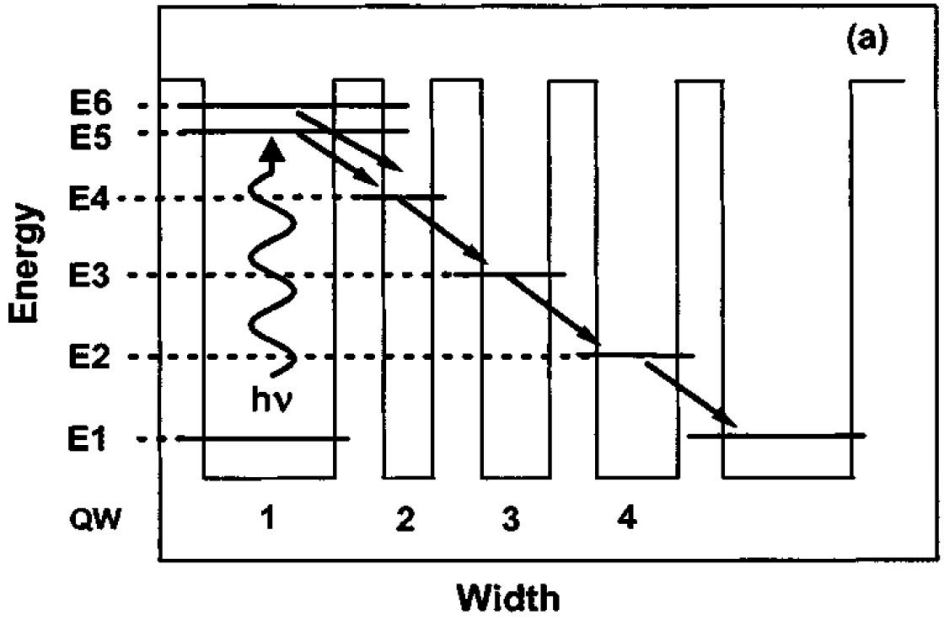
Novel structures

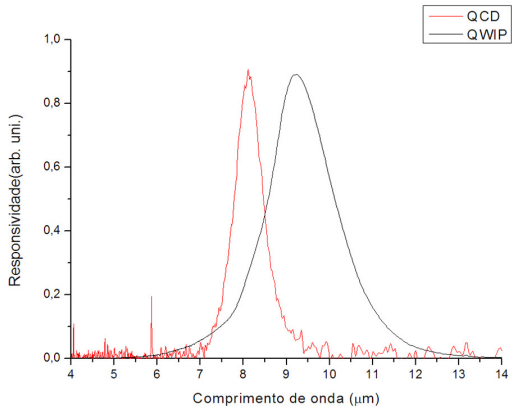
Quantum cascade IR detectors (QCD)

Advantages:

No bias
Extremely low dark current
Higher temperature operation



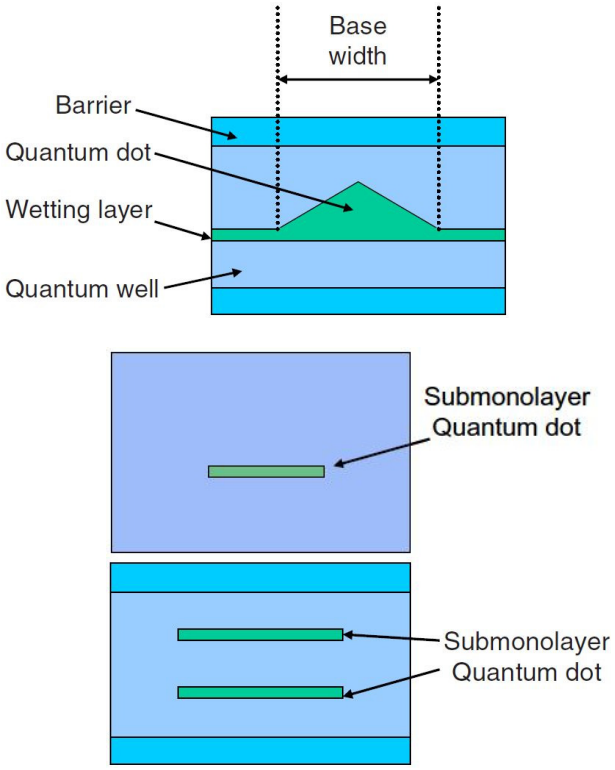


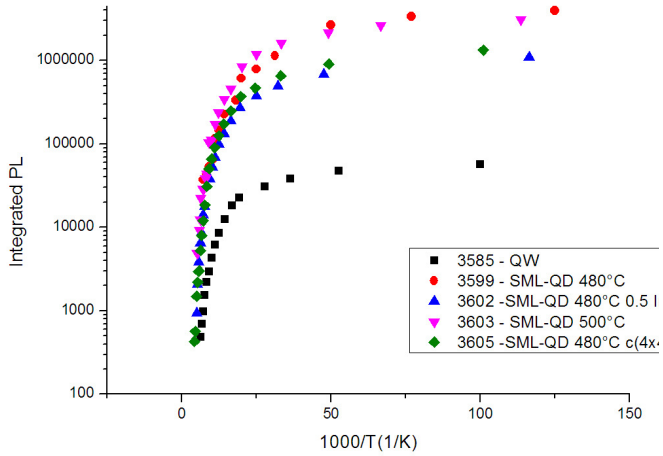


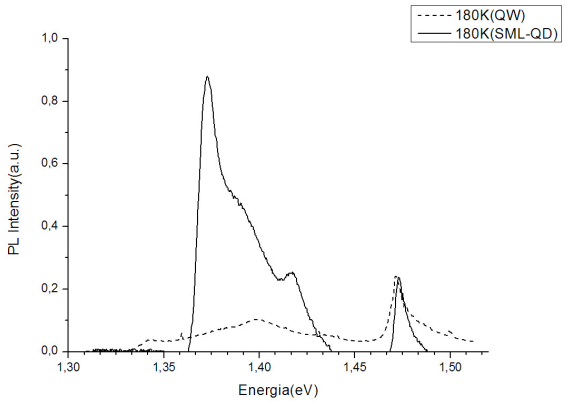
Mastering the working mechanisms and the technology of fabrication of mid-infrared semiconductor photodetectors

Sub-monolayer quantum dots and QDIPs

Control of dot size
Lateral confinement should improve the performance of QDIPs



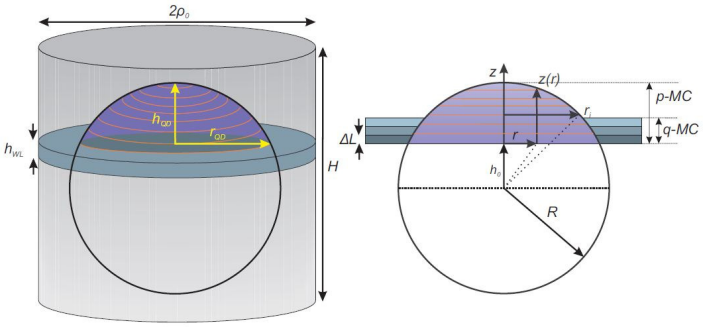




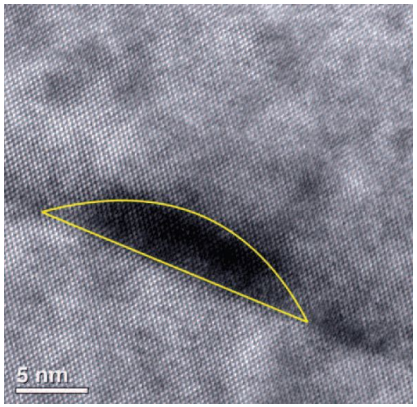
Understanding of the physical mechanisms involved in current generation and collection

Modelling/Simulation

In segregation



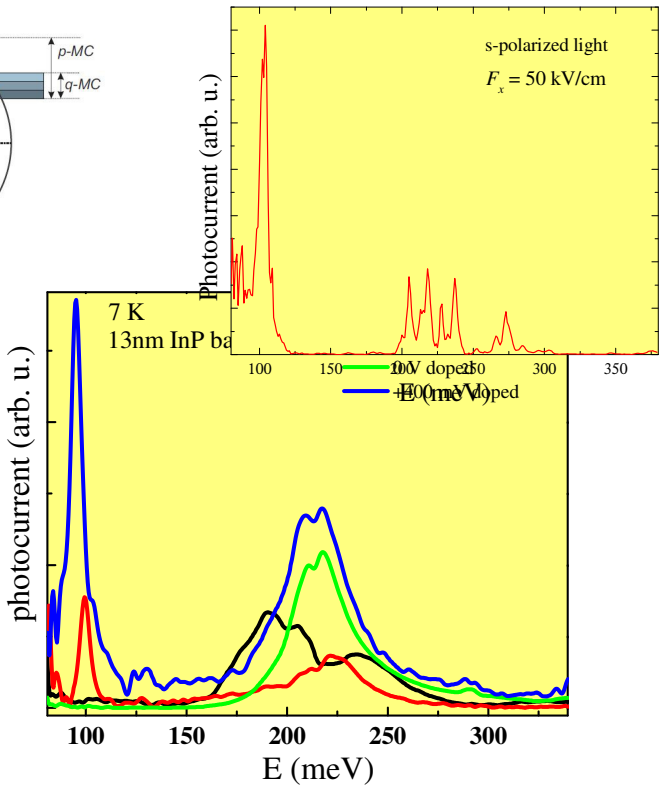
Change in energy levels



Maia et al, J. of Phys. D 2012
Schwan wt al, Appl. Phys. Lett. 2011
Martini et al, J. Vac. Sci. and Technol. 2010

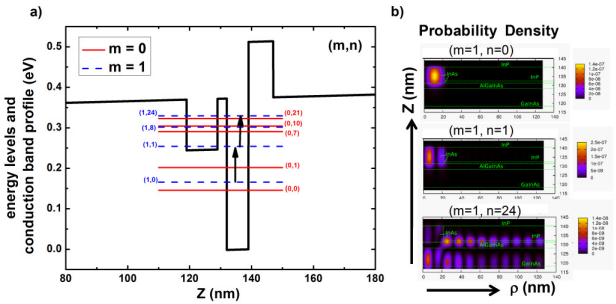
Split-operator

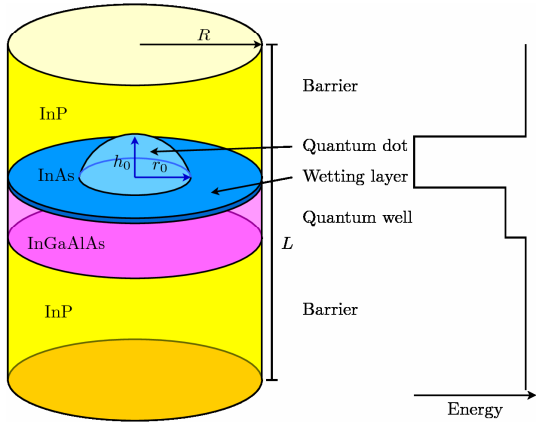
Multi photon process



Degani et al, J. Appl. Phys. 2011

3D effective mass calculations



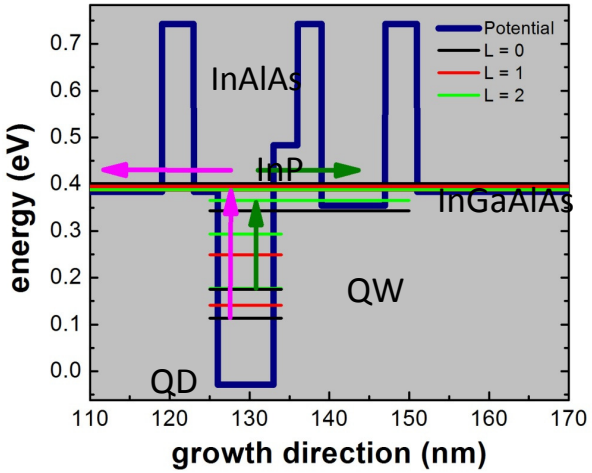


Auger scattering

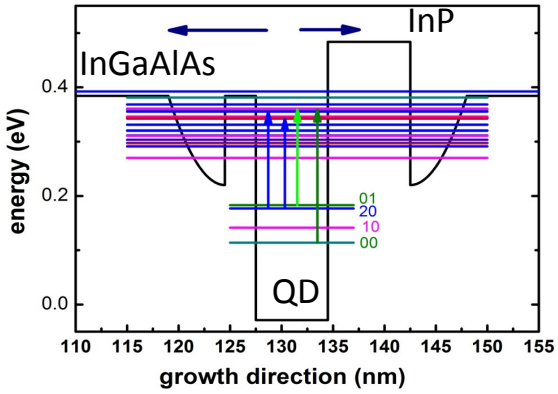
Gebhard et al, J. Appl. Phys. 2011

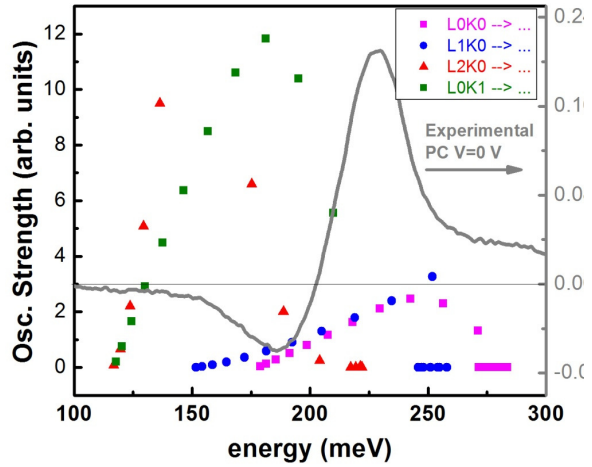
Understanding of the physical mechanisms involved in current generation and collection

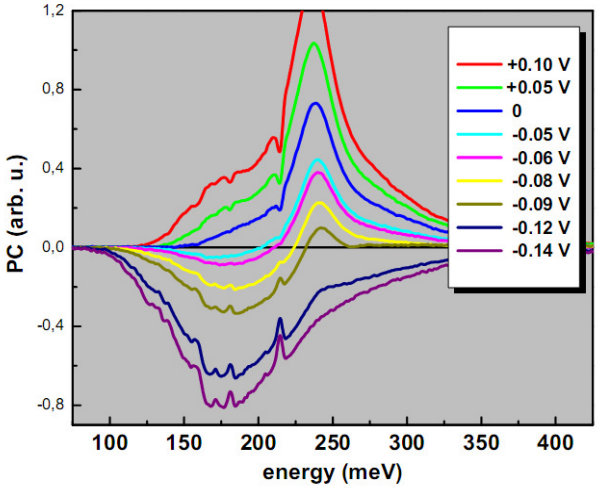
InGaAlAs/InAlAs/InAs/InP/InGaAs



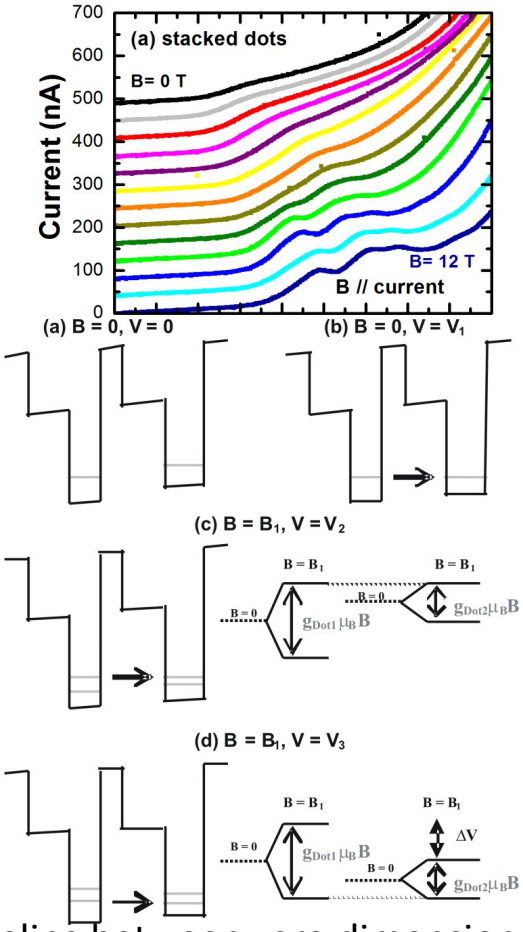
InGaAlAs/InAs/InP/InGaAs







Alvarenga et al, J. Appl. Phys. 2013

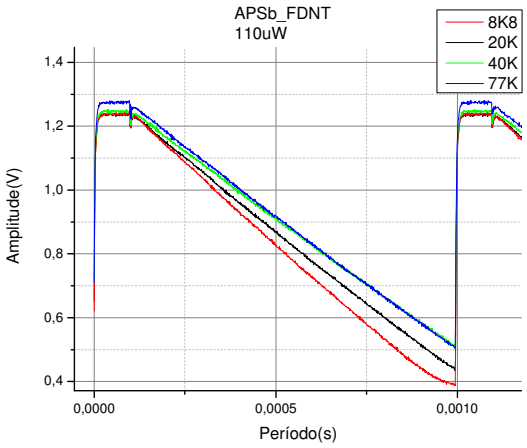


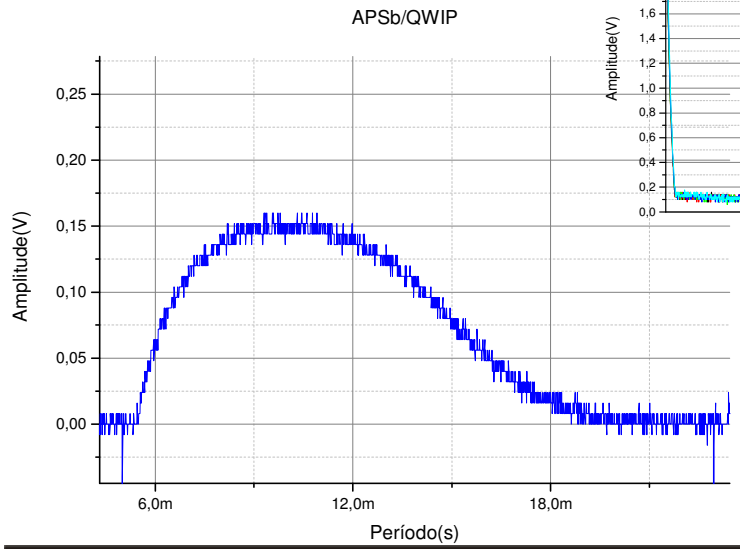
Tunneling between zero dimensional states with spin filtering

Silva et al, J. Appl. Phys. 2011

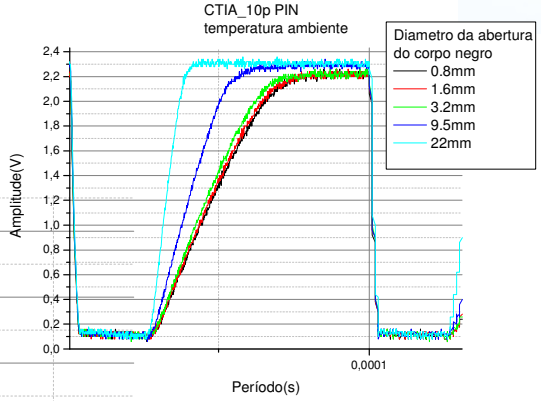
Development of the required circuitry for the read-outs of the photodetectors

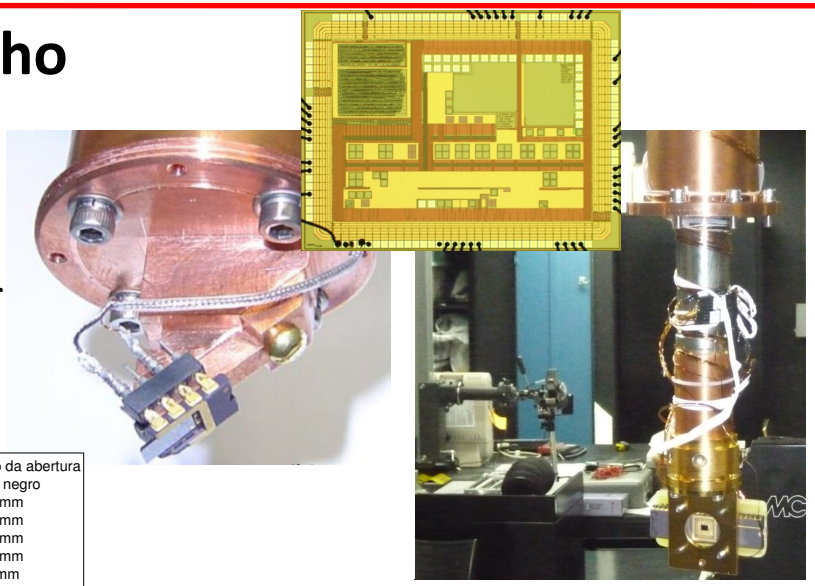
ROIC para detectores no infravermelho



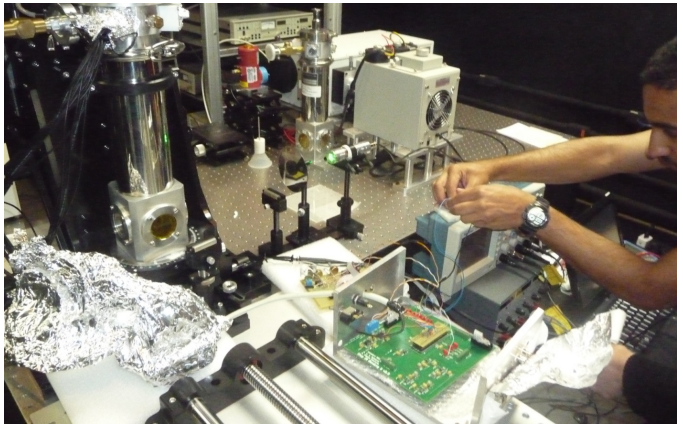


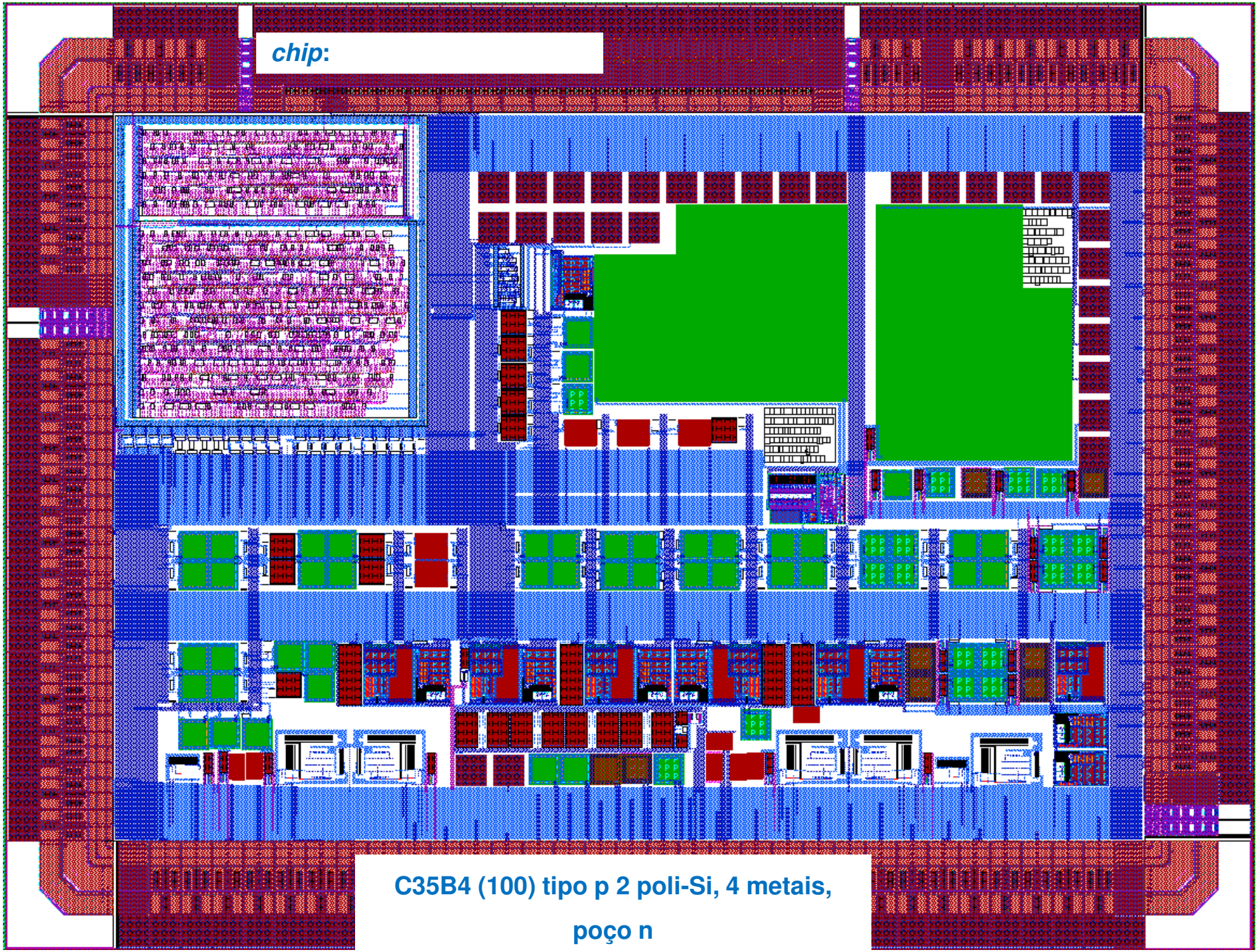
- First ROIC designed in Brazil and working at 300 K and even at low temperatures for hibridization with QWIPs and QDIPs





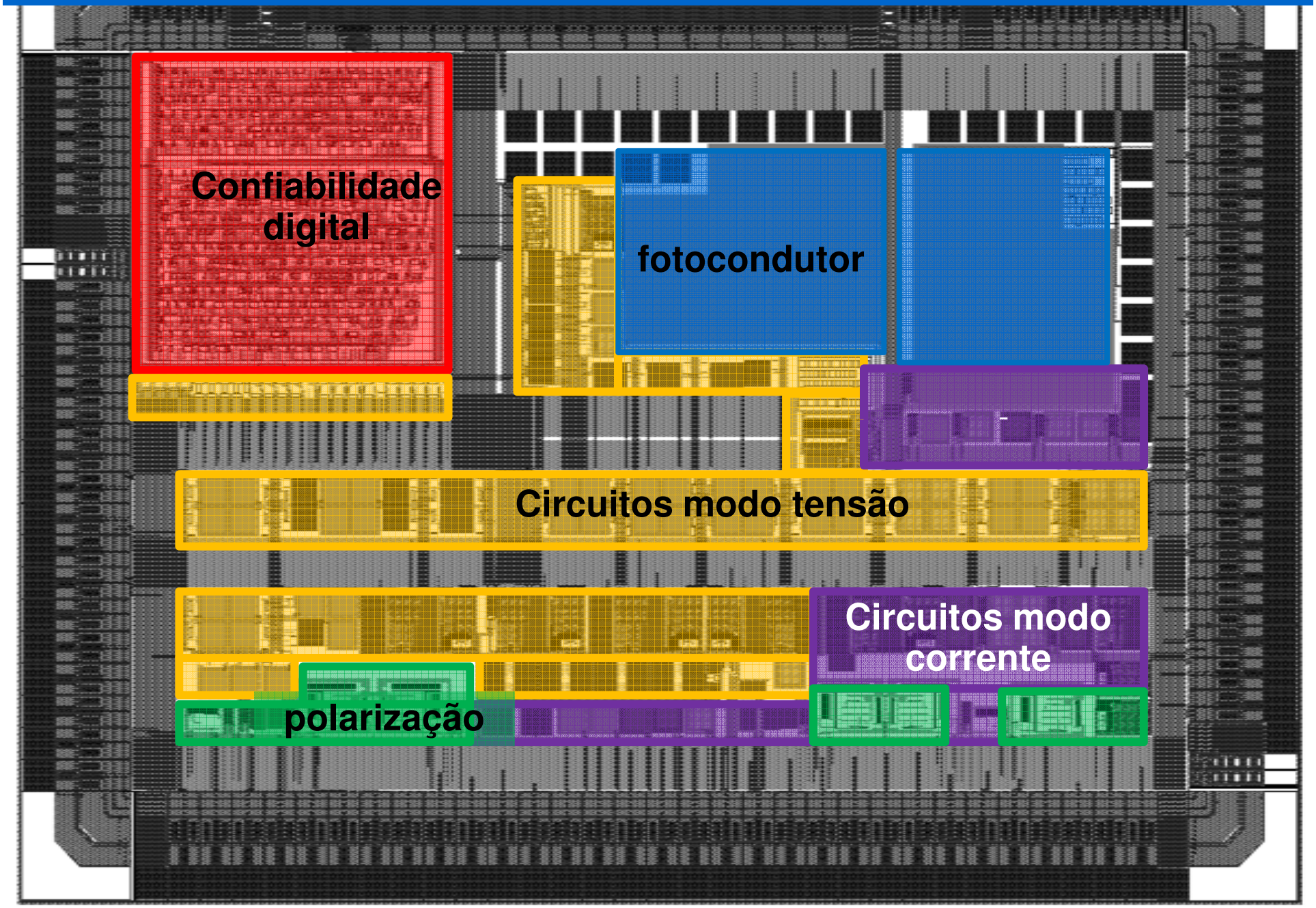
- The ROIC coupled to a QWIP and a QCD without optical modulation



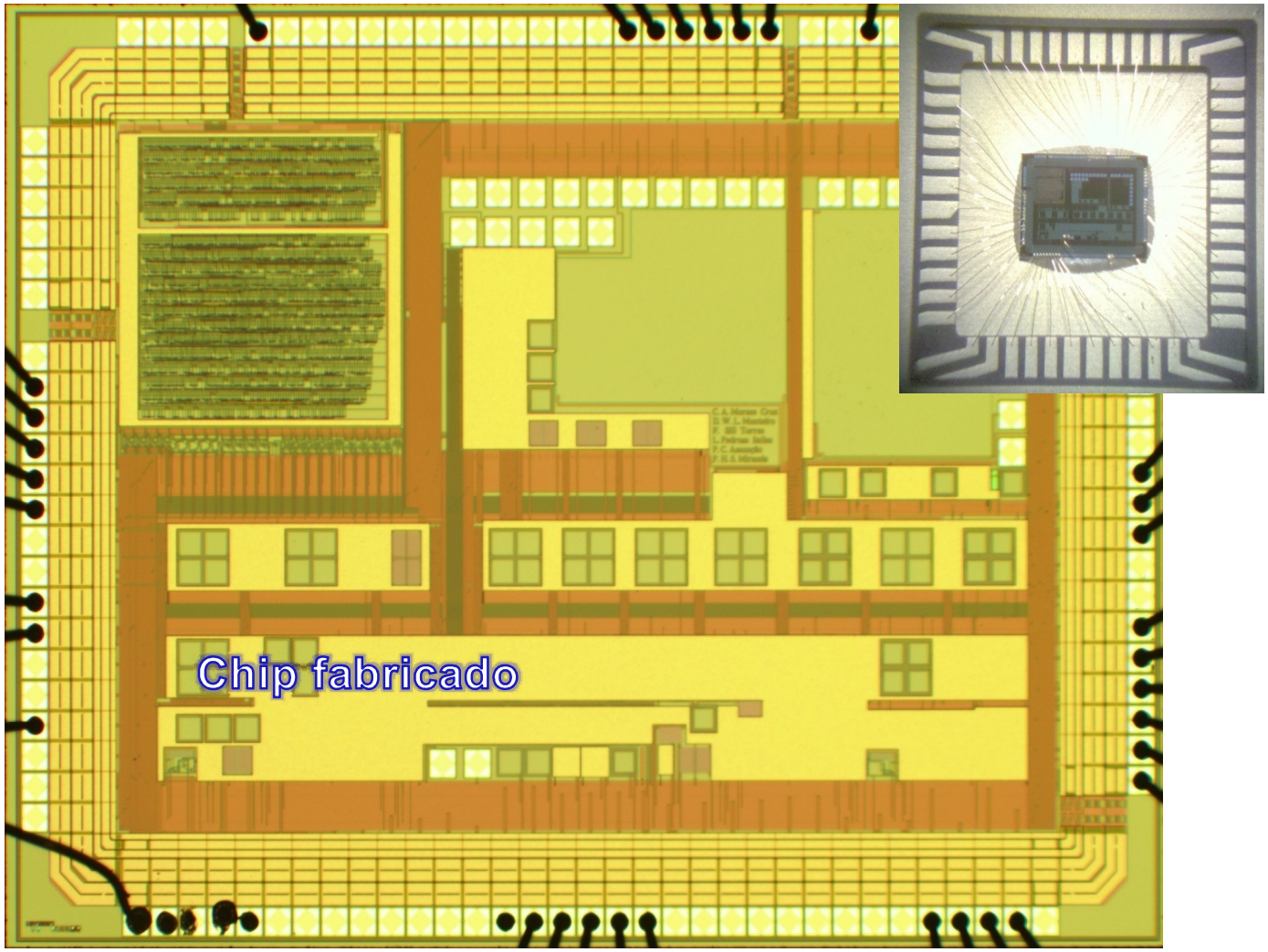

chip:
C35B4 (100) tipo p 2 poli-Si, 4 metais,
poço n

Chip 1 - DISSE

0.35um CMOS 12mm²

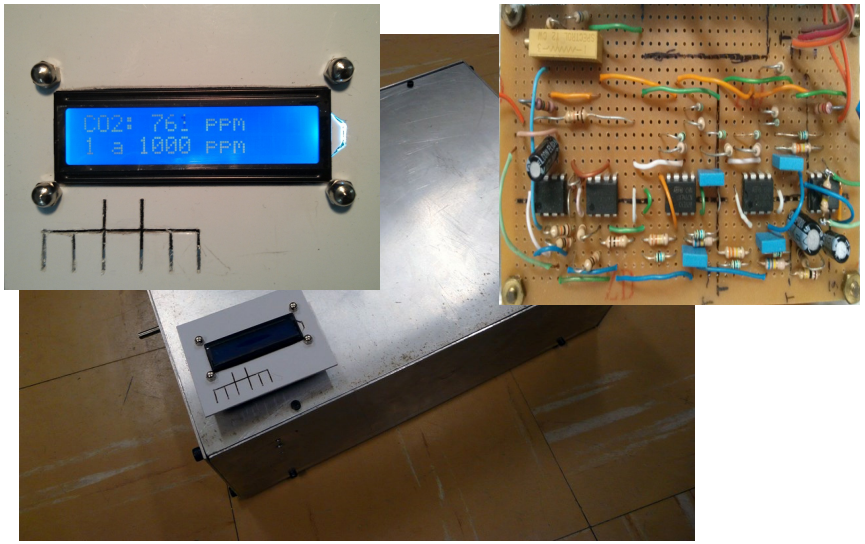


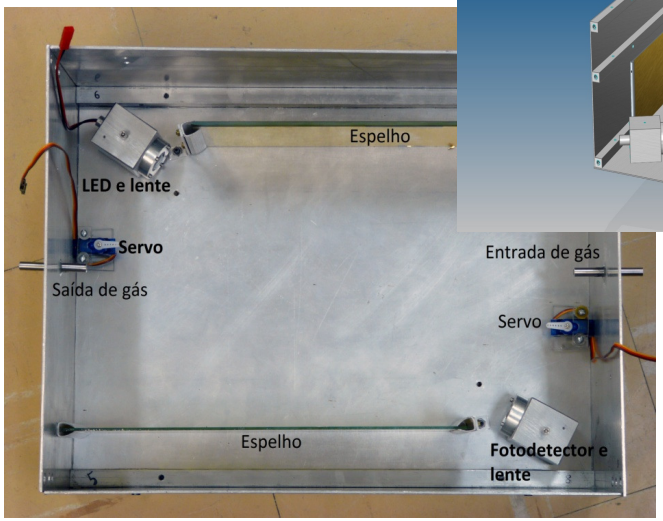
Development of the required circuitry for the read-outs of the photodetectors

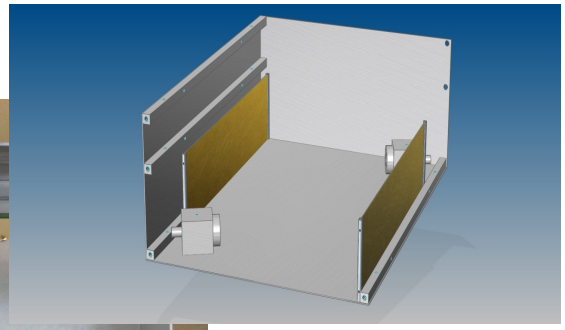


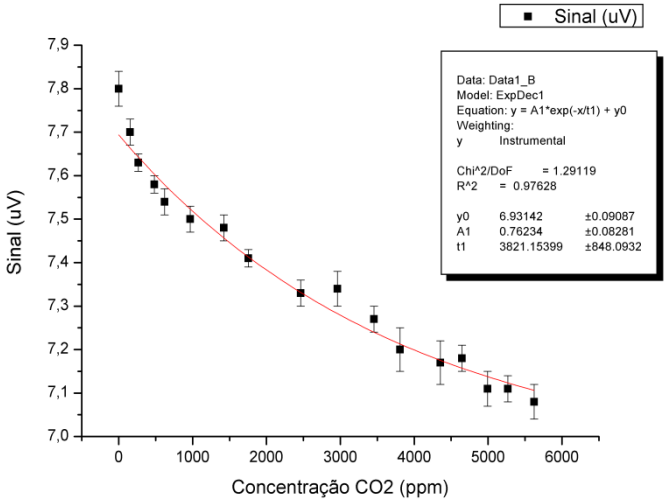
Salles et al, IEEE Sensors Journal 2009
Retes et al, Microelectron. Journal 2010
Coura et al, Sensors and Actuators 2012

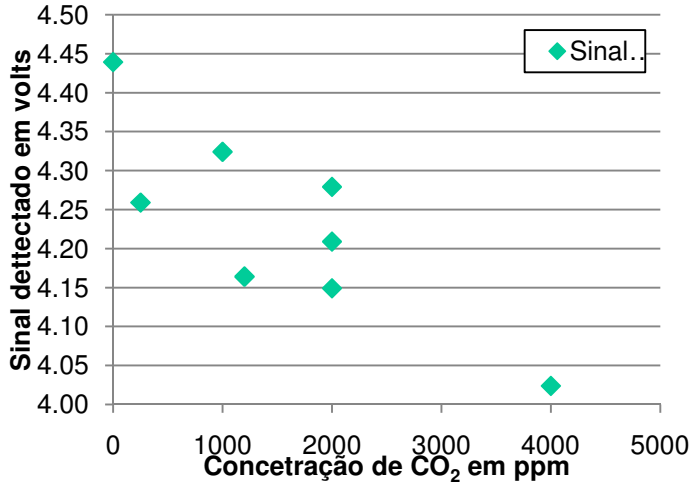
Design and fabrication of equipment which uses photodetection for relevant applications











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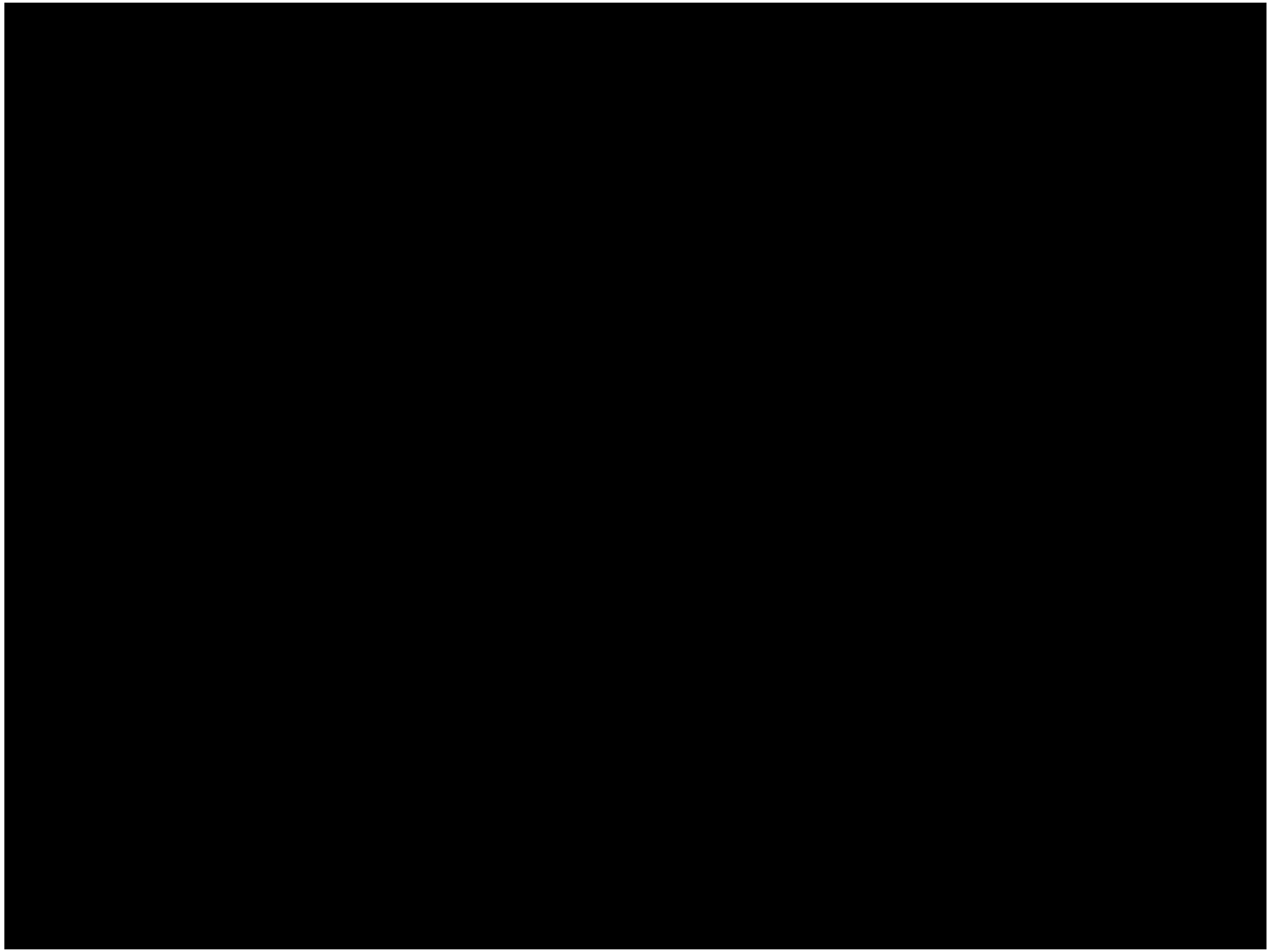
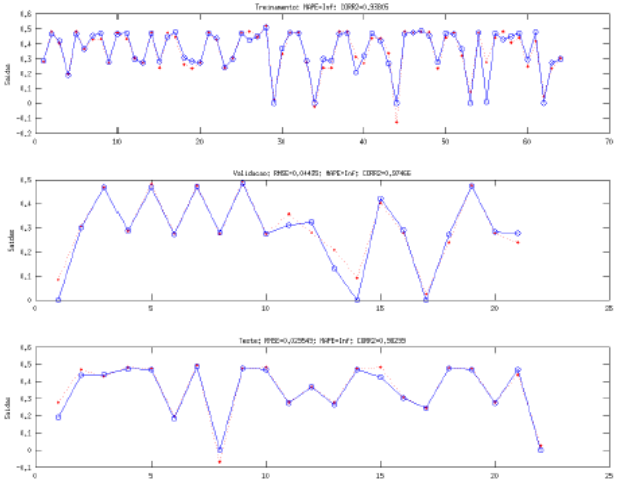
Design and fabrication of equipment which uses photodetection for relevant applications

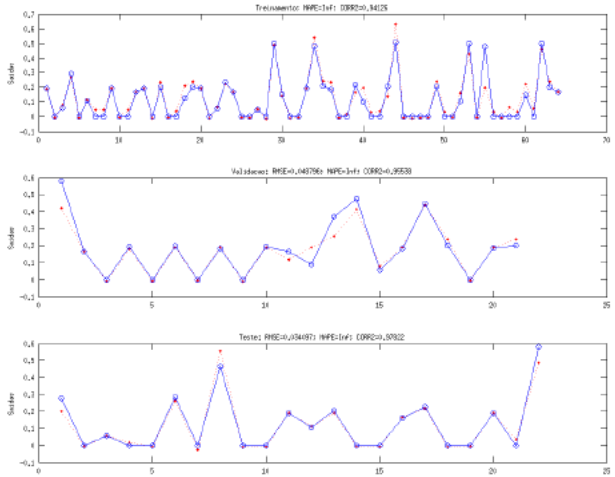


Inverse design

What are the synthesis parameters to achieve a sample with specific characteristics?

1) Get a pool of information from **previous experiments** in NanoTrack
2) Apply a computer system in order to learn from **previous data**
3) Optimize synthesis parameters in order to **find the desired structure**



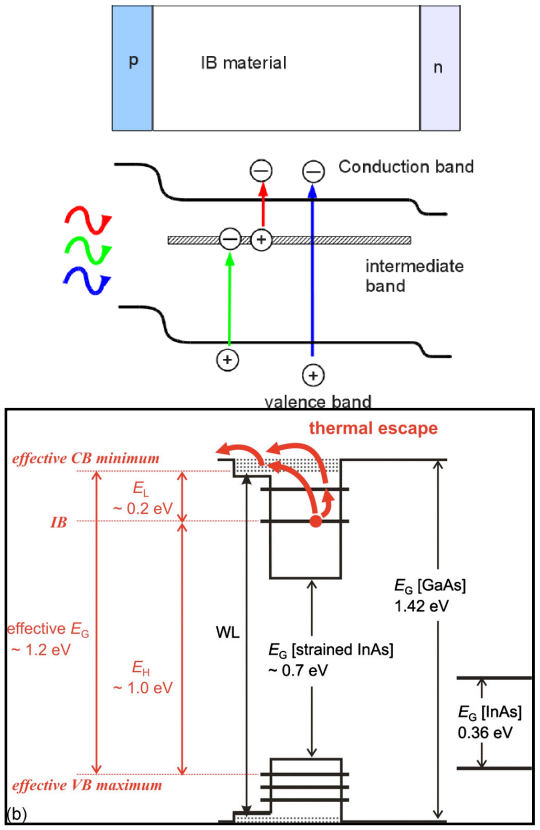


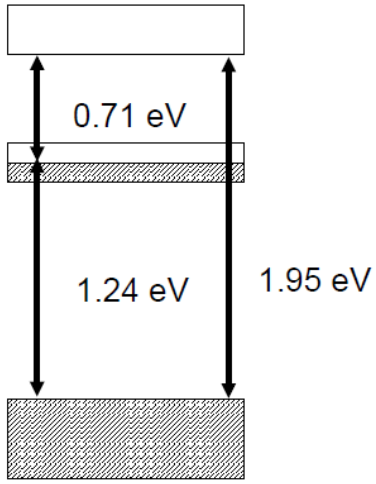
Singulani, at al, ICAM 2009
Dias et al, IEEE C. Evol. Computing 2011

- Blue line: real values
- Red line: predicted values.

Development of solar cells based on nanostructures

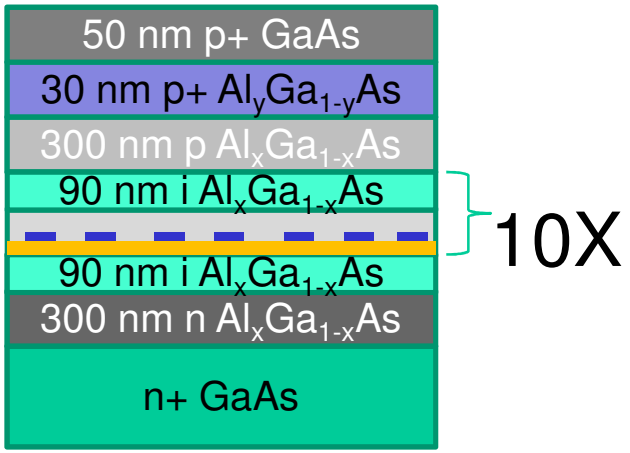
Intermediate band solar cells

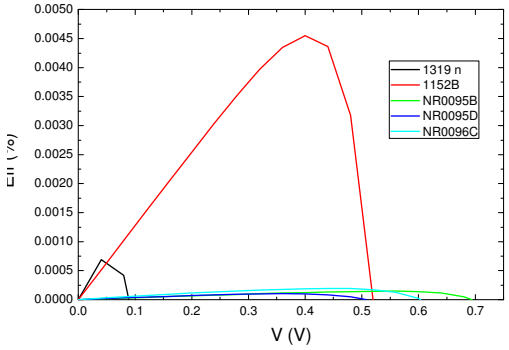




InAs/GaAs
Mostly investigated

InAs/AlGaAs
Our proposal for
1.95, 1.24 and 0.71 eV

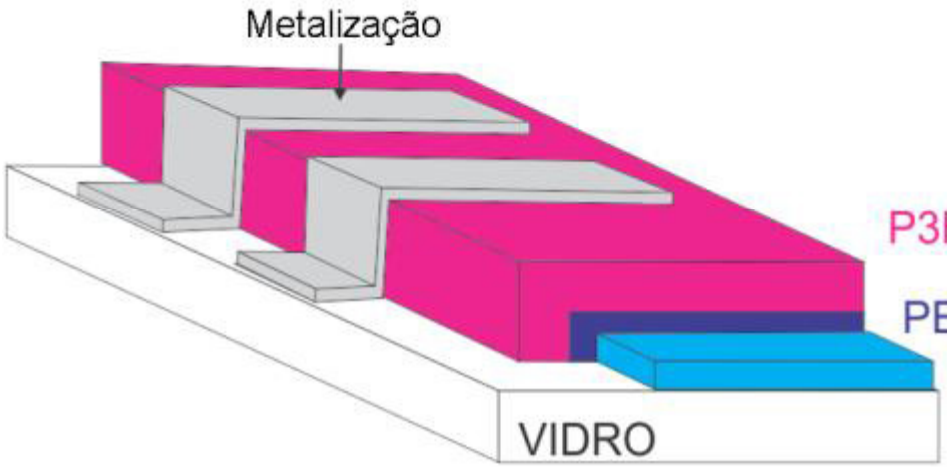


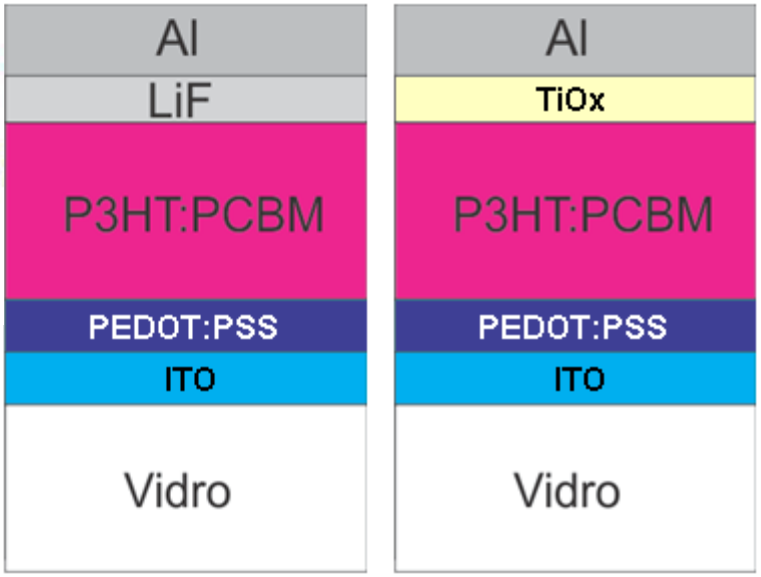


Micha et al, SBMicro 2013 accepted

Development of solar cells based on thin films

Titanium oxide thin film to improve the efficiency of polymer solar cells

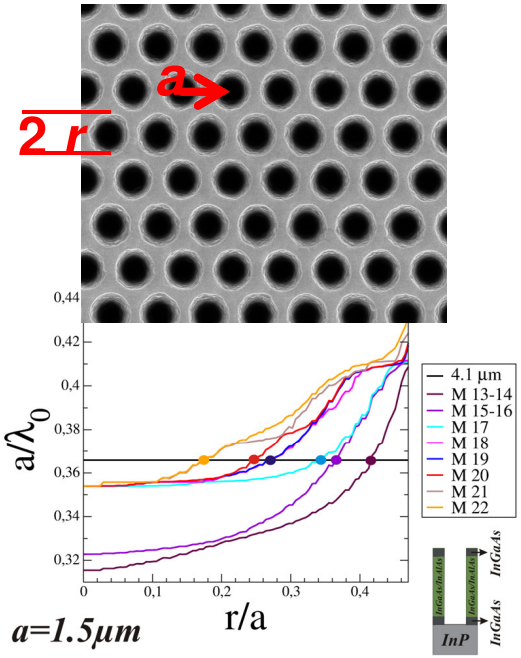


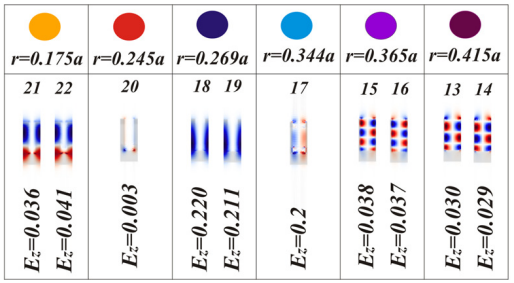


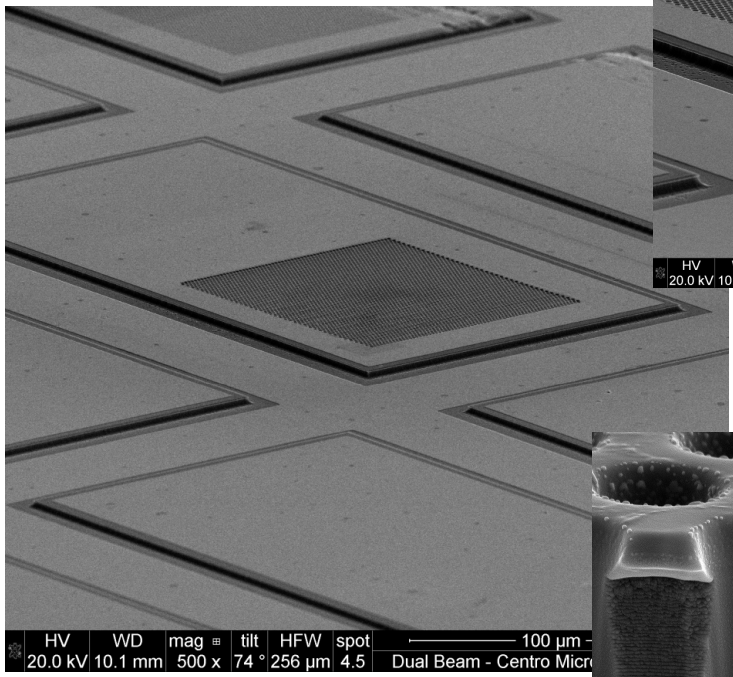
Araujo et al, Organic Electronics, 2012
Silva et al, Polymer Physics, 2010
Valadares et al, Sensors and systems, 2009

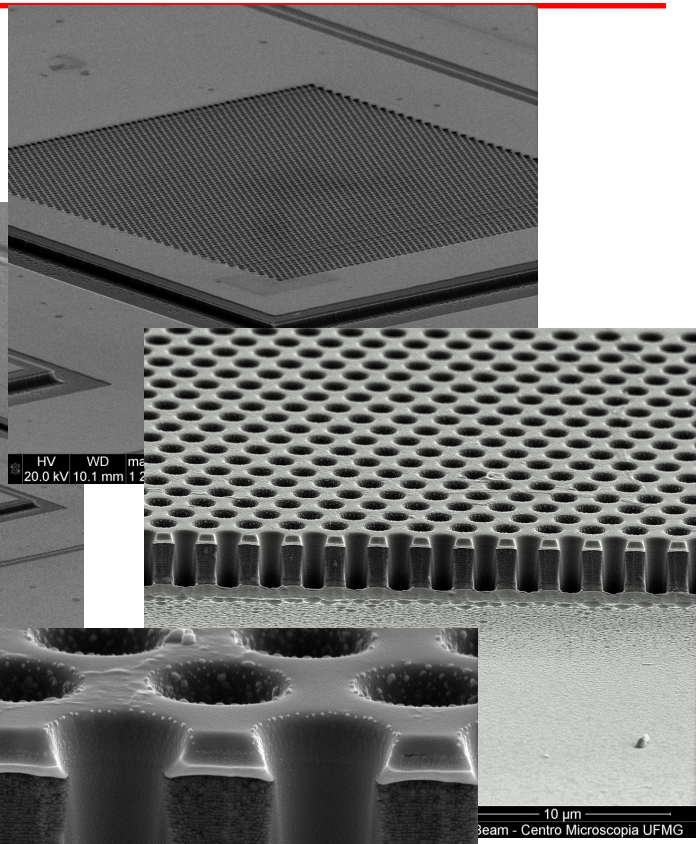
Group insertion in the international scenario with the development of novel semiconductor nanodevices

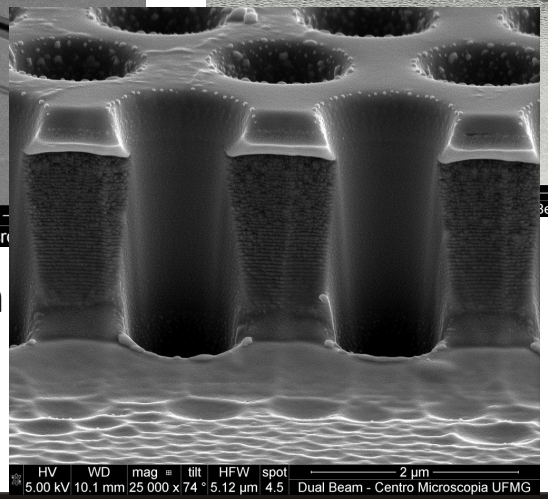
QWIPs coupled to a Photonic Crystal











Alternative of using a diffraction grating to couple the QWIP to the radiation to be detected, in normal incidence

Vasco et al, QSIP, 2012

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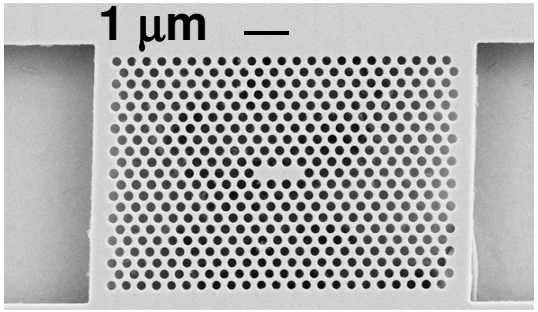
Group insertion in the international scenario with the development of novel semiconductor nanodevices

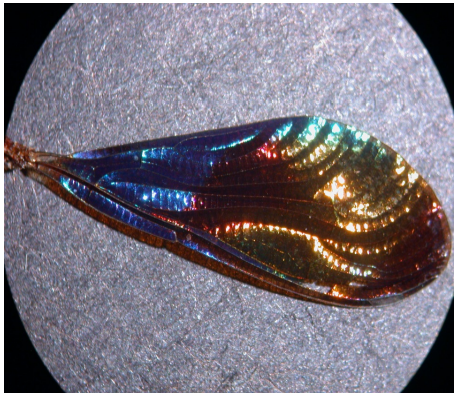
Fano resonances in photonic crystals

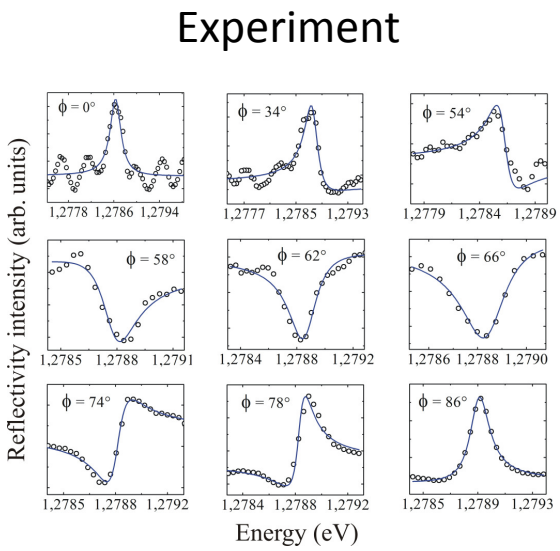
L3 photonic crystal cavities



Nature's photonic crystal

Wing of *Chautopteryx*



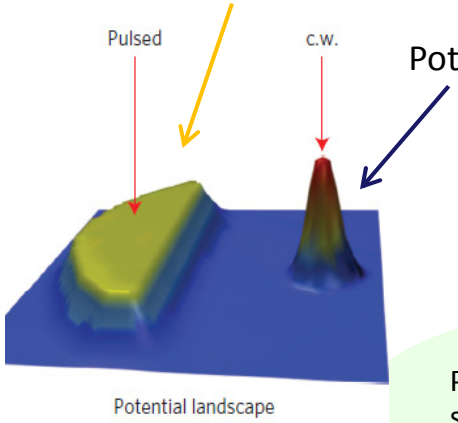


*Valentim et al., Applied Physics Letters **102**, 111112 (2013)*

Group insertion in the international scenario with the development of novel semiconductor nanodevices

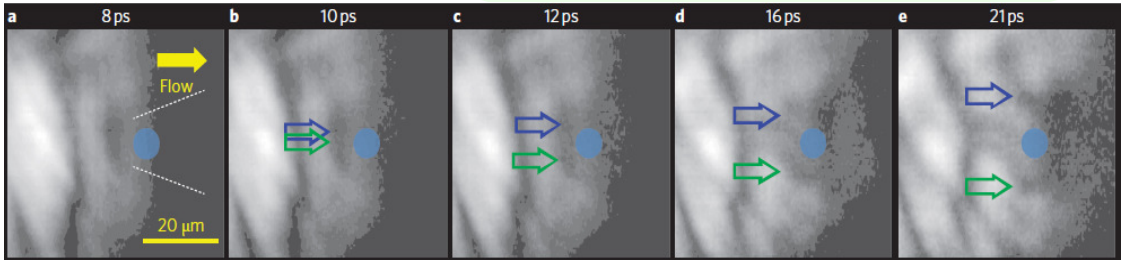
Flow of polaritons through an optically created potential barrier

Polariton flow generated by a pulsed laser



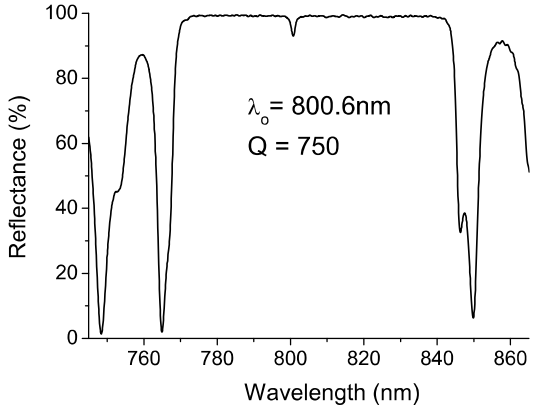
Potential barrier created by a strong CW laser

Polariton flow through the barrier (blue circle) seen via the light emission:

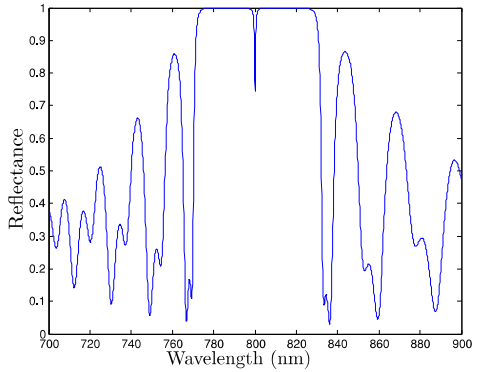


*Sanvitto et al., Nature Photonics **5** 610 (2011)*

Determining the optimized architecture of microcavities for best device performance using GA



Mirrors of $Al_{0.2}Ga_{0.8}As/AlAs$

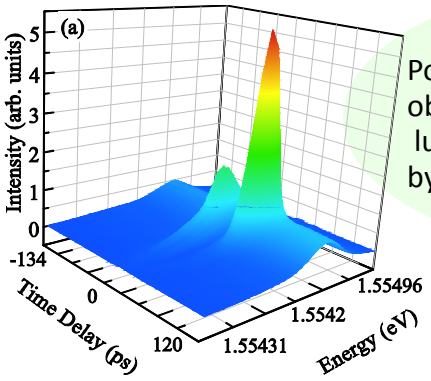


Mirrors of $Al_{0.17}Ga_{0.83}As/Al_{0.88}Ga_{0.12}As$

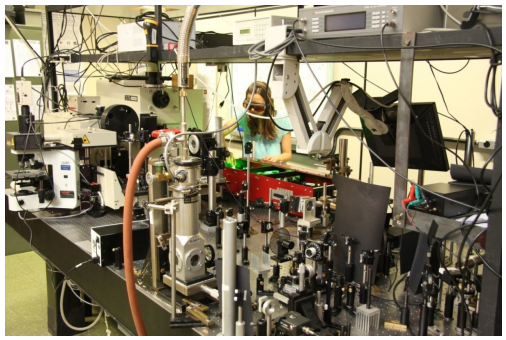
Group insertion in the international scenario with the development of novel semiconductor nanodevices

Polaritons in microcavities

- Pseudo spin dynamics of exciton-polaritons in semiconductor microcavities
- Longitudinal-transversal polariton splitting in semiconductor microcavities
- Parametric oscillation: polaritons population dynamics in a semiconductor microcavity

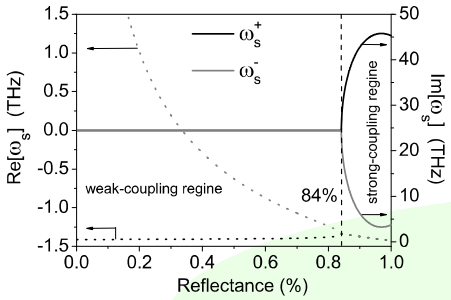


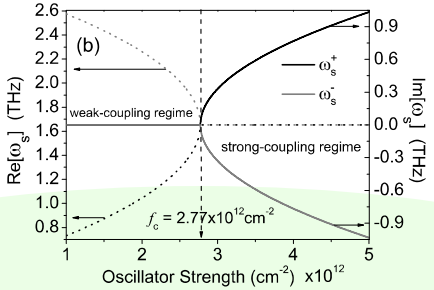
Polariton parametric oscillation observed in the lower branch luminescence excited resonantly by 100 fentosecond pulse laser.

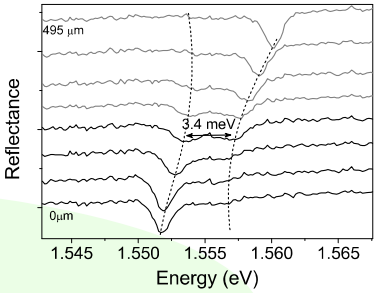


Polaritons laser

- Development of an optical transistor using semiconductor microcavities







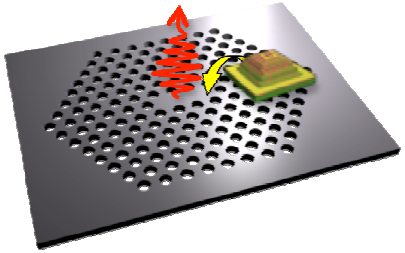
Conditions for strong coupling regime

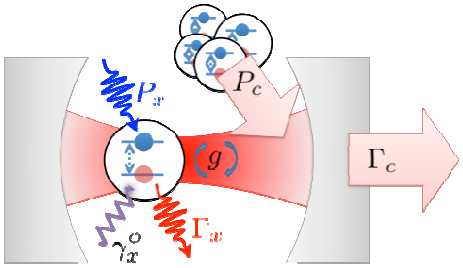
Matinaga et al, OECS 2009
Matinaga et al, ICPS 2010

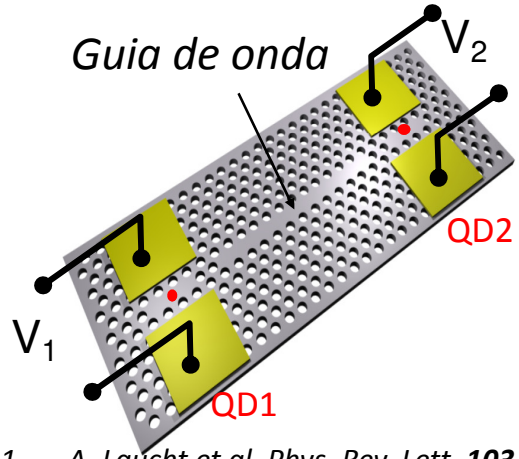
INSTITUTO NACIONAL DE CIÊNCIA E TECNOLOGIA
NANODISPOSITIVOS SEMICONDUTORES

Group insertion in the international scenario with the development of novel semiconductor nanodevices

Theory of quantum dots in microcavities

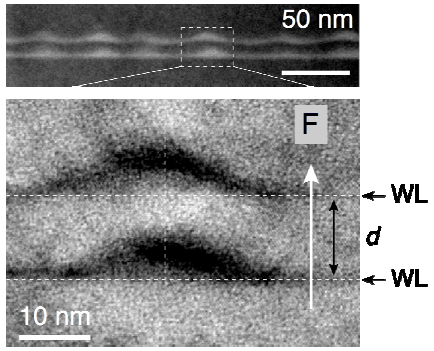


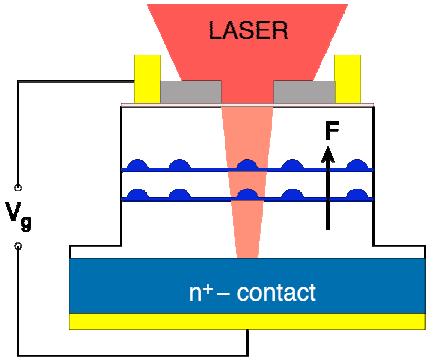




1. *A. Laucht et al. Phys. Rev. Lett.* ***103****, 087405 (2009)*
2. *A. Laucht et al. Phys. Rev. B* ***82****, 075305 (2010)*
3. *F. P. Laussy et al. Phys. Rev. B* ***84****, 195313 (2011)*
4. *F. O. Prado et al. Phys. Rev. A* ***84****, 053839 (2011)*
5. *W. J. Lima and J. M. Villas-Bôas, to be published.*
6. *A. Freitas and J. M. Villas-Bôas, to be published.*

Molecules of quantum dots





- **Transparency electromagneticaly induced**
- **Coherent control**
- **Quantum computing**
- **Energy transparency**
- **Spin manipulation**

1. *H. S. Borges et al. Phys. Rev. B* ***81****, 075322 (2010)*
2. *M. M. Santos et al. Phys. Rev. A* ***85****, 032323 (2012)*
3. *H. S. Borges et al. Phys. Rev. B* ***85****, 115425 (2012)*
4. *K. Müller et al. Phys. Rev. Lett.* ***108****, 197402 (2012)*
5. *J. M. Villas-Bôas, to be published.*
6. *G. Azevedo and J. M. Villas-Bôas, to be published*

International insertion

Collaborations and exchanges

- TU-Wien strong collaboration with the groups of Profs Karl Unterrainer and Gottfried Strasser
- University of Sheffield with the group of Prof. Skolnick
- Universidade de Antióquia, with the group of Prof. Boris Anghelo Rodriguez Rey
- Princeton Unversity/MIRTHE with the group of Professor Claire Gmachl
- Laboratoire de photonique et nanostructures with the group of Dr. Jean Dagobert
- Middle East Technical University with the group of Prof. Cengiz Besikci
- Univesité du Languedoc Montpellier with Professor Francis Guastavino
- Univesidade Nacional da Colômbia, Bogotá with Prof. Herbert Vinck Posada
- Universidade Católica de Louvain (Bélgica) with Benoit Hackens
- NN Lecce-CNR, Itália collaboration with Daniel Sanvitto
- Université Claude Bernard Lyon 1, with Prof. Dr. Guo-Neng Lu e Prof. Dr. Patrick Pittet
- Université Joseph Fourier – Grenoble, Prof.Dr. Gilles Sicard and Prof.Dr. Skandar Basrour
- Tohoku University – Sendai , Prof. Dr. Shuji Tanaka and Prof. Dr. Tomohiro Ishikawa
- Delft University of Technology – Delft , Prof.Dr. Patrick J. French and Prof.Dr. Albert Theuwissen
- Technische Universität Kaiserslautern – Kaiserslautern with Prof. Dr. Norbert Wehn

Human Resources/Education

I. International exchange

- **Germano Penello, Ph.D. student at Princeton University and now going for a post-doc**
- **Déborah R. Alvarenga, Ph. D. student at TU-Wien**
- **Daniel Micha going for sandwich in Freiburg, Germany**
- **Thiago Moura, Ph. D. student at Tohoku University - Tanaka Lab - Sendai/Japan**
- **Carlos Augusto Cruz, Ph. D. student at Université Joseph Fourier, Grenoble, France**
- **Patrick dos Santos, , Ph.D. student at Université Claude Bernard Lyon 1 - INL – Lyon, France**
- **Three participations at ESONN (European School of Nanosciences and Nanotechnologies)**
- **Six French undergraduate students in Brazil**
- **Students to and from Colômbia**
- **Luciana Dornellas, at Alcatel France for a post-doc**
- **Dr. Roberto Jakomin from Italy-France post-doc**
- **Dr. Loïk Gence from Belgium as a post-doc**
- **Prof. Mauricio Pires spent a sabatical leave at Alcatel, France**
- **Prof. Patrícia L Souza spent a sabatical leave at TU-Wien**

II. Science without Borders

5 undergraduate students
4 graduate students

III. Fellowships in Brazil from INCT Capes and CNPq

- ***4 PDJ***
- ***4 Post-doc***
- ***1 Post-doc abroad***
- ***2 Sandwich abroad***
- ***19 DTI***
- ***3 Masters***
- ***4 Doctor degrees***
- ***30 IC***
- ***8 AT***

Human Resources/Education

IV. Industry/ Training

- **Students working on topics which are strategically relevant**
- **Close interaction with industry**
- **Favorable conditions for the creation of *spin-offs***
- **Training of microscopists**
- **Students in contact with the industries and government offices with which we collaborate**
- **One Ph.D. working in a company in the field**

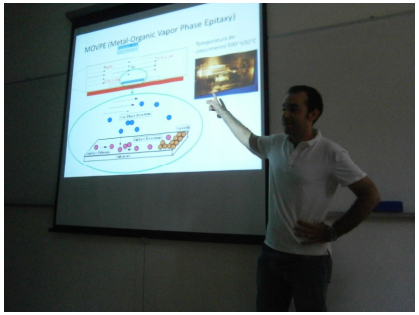
V. New placements

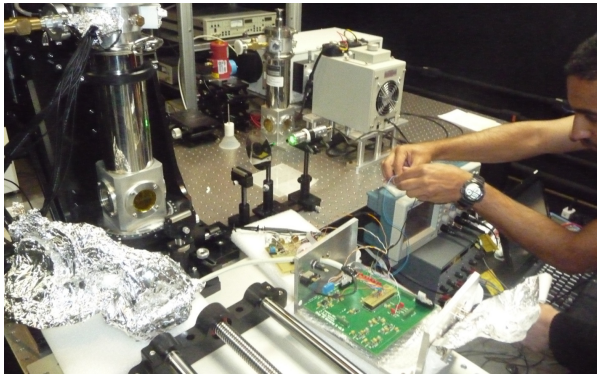
- **20 Master students continued to a Ph. D. in the field within the INCT-DISSE**
- **2 Master students working in labs of interest in the field**
- **5 Ph. Ds. working as post-doc in the field within the INCT-DISSE**
- **4 Ph. Ds. are professors now, three within the field within the INCT-DISSE**
- **3 Ph. Ds. working at companies**
- **Omar Villela Neto now professor at UFMG**
- **Luciana Pedrosa Salles now professor at UFMG**
- **Pablo Valentim now professor at UNII - BH**
- **José Maria Villas Boas now professor at UFU**
- **Marcelo Maialle and Marcos Degani now professors at Unicamp, Limeira**

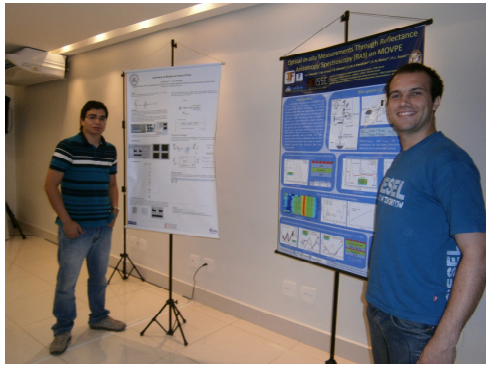
Human Resources/Education

VI. Numbers

Underway	*Finished*
• 7 post-docs	• 7 post-docs
• 4 DTI	• 15 DTI
• 22 PhDs	• 12 PhDs
• 8 Masters	• 35 Masters
• 40 IC	• 48 IC
• 3 AT	• 5 AT

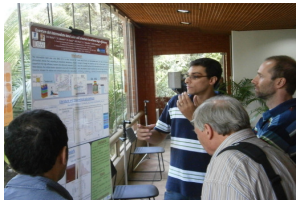






Human Resources/Education

VII. Promotion of workshops and schools



1. **Summer School on Fundamentals and Materials for Novel Sensors, 2009, International**
2. **IEEE/CASS Workshop on Image Sensors, 2009 Regional**
3. **II Workshop on Effects of Ionizing Radiation in Electronic and Photonic Devices for Space Applications, 2009, International**
4. **EULASUR Workshop From Materials to Products, 2011, International**
5. **BRASSON – Escola Brasileira em Nanotecnologia e Nanociência, 2011**
6. **Workshop on Infrared Technology, 2011, National**
7. **I Escola de Verão em Computação do PPGCC/DCC/UFMG, 2012, National**
8. **Semana Nacional de Ciência e Tecnologia, Portas abertas do IF, 2012, Regional**
9. **PUC+Energia 2012, National**
10. **Workshop in Solar Cells, 2012, National**

WORKSHOP_ON solar cells

Human Resources/Education

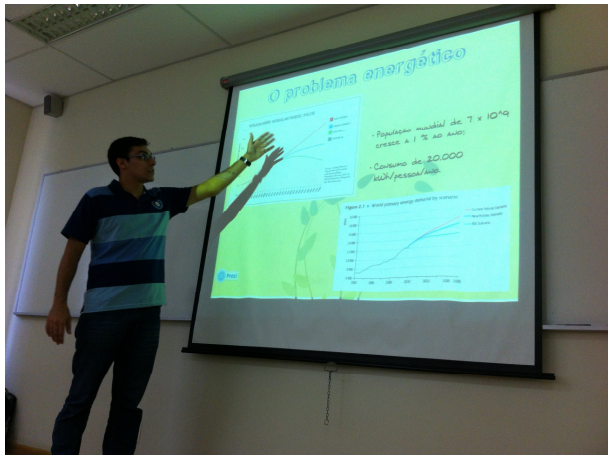
VIII. Graduate and undergraduate programs

1. Sensors and attenuators at ITA with the participation of our members from IEAv

2. Engineering of Nanotechnology at PUC-Rio to start in March 2011
with a weekly seminar since 2013 on Nanoscience and nanotechnology with top level invited speakers

VIII. New courses

1. **Introdução a Nanotecnologia, PUC-Rio since 2009**
2. Nanodispositivos, PUC-Rio since 2009
3. **Nanocomputação, UFMG since 2011**
4. Nanotecnologia computacional, UFMG since 2012
5. **Nanotecnologia computacional, PUC-Rio since 2013**
6. Detecção e análise de imagens, UFMG 2011
7. **Física de Dispositivos Semicondutores, IEAv – ITA, 2012**
8. Métodos Numéricos e Aplicações em Clusters- I, IEAv – ITA, 2012
9. **Métodos Numéricos e Aplicações em Clusters- II, IEAv – ITA, 2012**
10. Sensores II, IEAv – ITA, 2012
11. **Óptica Moderna, UFAM since 2009**
12. Heteroestruturas Semicondutoras, UFAM, 2010



Outreaching actions

Relation to society

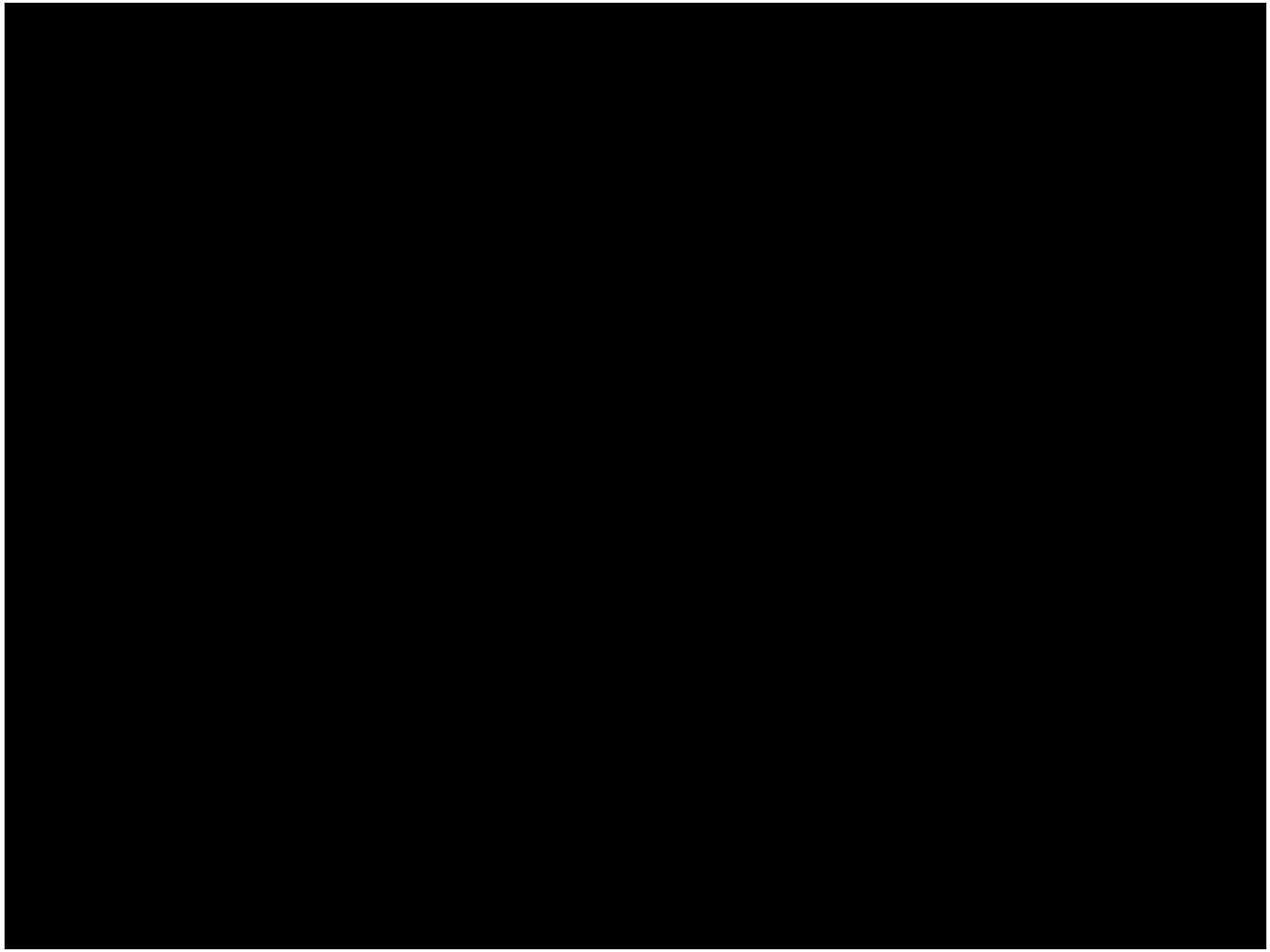
Youtube
Facebook
Twitter
webpage

Science education

Video "Ver o Invisível"

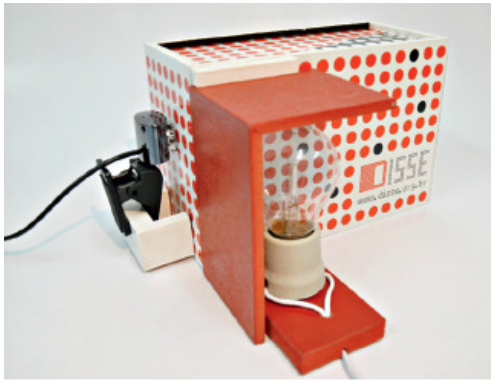
- distributed in science museums, positive return
- available on the webpage and Youtube channel
- shown in many different events such as:
  - *PUC por um dia*
  - *Science Week*
  - *Knowledge Week UFMG*
  - *Science Circus*
  - *Innovation fair USP*
  - *Program ParFor/Novo Airão AM*
  - *Matogrossense school*

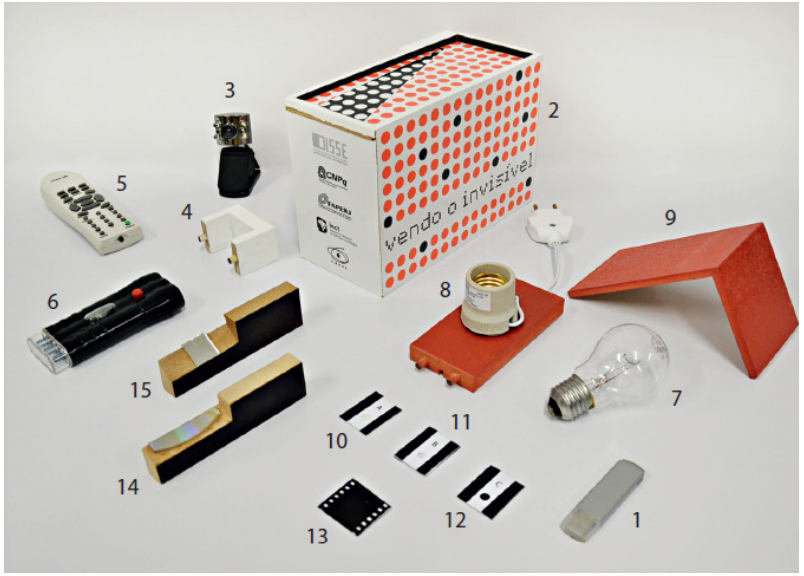
Outreaching actions

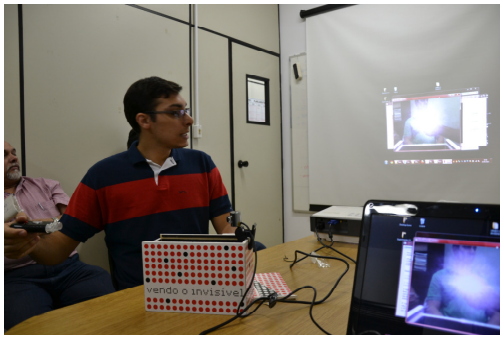


Outreaching actions

Development and distribution of experimental kit on IR radiation:
VENDO O INVISÍVEL







Outreaching actions

Other activities

- Articles in journals such as Física na Escola and Revista Brasileira de Ensino
- Inumerous lab visits in most units for schools, graduate and undergraduate students
- Seminars to undergraduate students to attract them to the field
- Seminars in schools to raise the pupils' interest in science
- Participation in events such as Science and Literacy on Science Popularization
- Series of seminars on Nanotechnology for freshmen students
- Seminar on the present situation of science dissemination in Brazil during the XXVII Encontro de Físicaos do Norte e Nordeste
- Nanokits for schools and undergraduate students
- EnTenda C&T

DISSE on the Media

- Two articles on the Faperj magazine in 2009
- *Do laboratório para o dia a dia* article at *Ciência Hoje* written by one of the members about the Nobel Prize winner last year
- *O admirável nanomundo*, article written by a member and published at *OGLOBO*
- Online interview with general public promoted by Fapesp
- *Nanotecnologia contribui para áreas como a medicina*, article at *Folha de São Paulo, Guia de Profissões* with contribution from members.
- *Pensando pequeno*, article on *.EDU* interview with a member.
- Interview for Tribuna de Minas
- Inauguration of new equipment for producing semiconductor material had more than 20 insertions in the media
- Article at Gazeta do Amapá about new lab equipment installed


JORNAL da CIÊNCIA

Órgão da Sociedade Brasileira para o Progresso da Ciência

SBPC

HOME NOTÍCIAS ÚLTIMAS EDIÇÕES SERVIÇOS

Edição impressa

Notícias

Domingo, 30 de junho de 2013

JC e-mail 4609, de 23 de Outubro de 2012.

1. Boa notícia para telecomunicações e tecnologia digital do Brasil

O Centro Técnico Científico da PUC-Rio inaugura o mais moderno equipamento de deposição de materiais semicondutores da América do Sul com a presença do ex-ministro de Ciência e Tecnologia, Sergio Rezende.

Um equipamento de ponta, que produzirá matérias-primas para a fabricação de artigos como DVDs, detectores e dispositivos eletrônicos e ópticos, acaba de ser inaugurado no Centro Técnico Científico da Pontifícia Universidade Católica do Rio de Janeiro. A cerimônia, realizada ontem (22), contou com o ex-ministro da Ciência e Tecnologia, Sergio Rezende, e o vice-reitor para Assuntos Acadêmicos da universidade, José Ricardo Bergmann.

Trata-se do mais moderno equipamento de deposição de materiais semicondutores existente na América do Sul, de acordo com Patricia Lustoza, do Centro de Estudos em Telecomunicações (CETUC/PUC-Rio) e líder em pesquisa tecnológica do Instituto Nacional de Ciência e Tecnologia em Nanodispositivos Semicondutores (Disse), que está à frente do projeto. O aparelho faz parte do Laboratório de

Próxima

Índice de Notícias

Acesse aqui para ler a edição completa JC 740 Impresso


AVANÇO TECNOLÓGICO

Na Unifap, microscópio de força atômica proporcionará estudo detalhado em plantas amazônicas

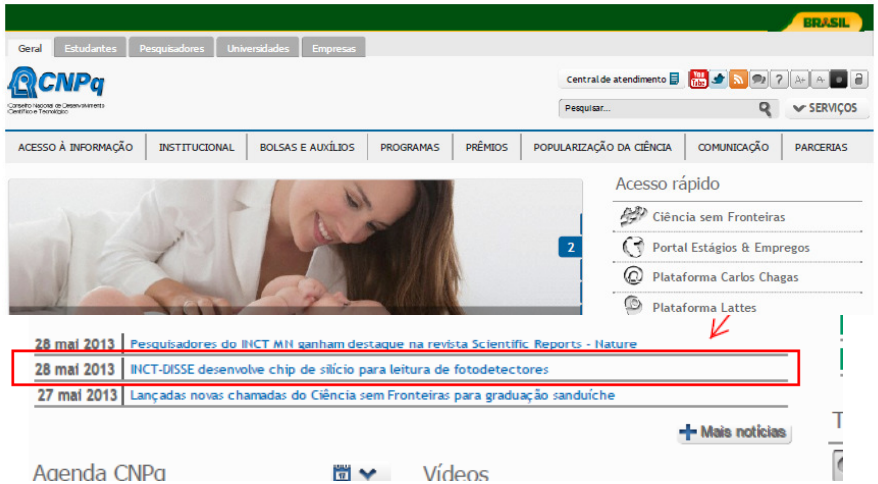
INSTITUTO NACIONAL DE CIÊNCIA E TECNOLOGIA

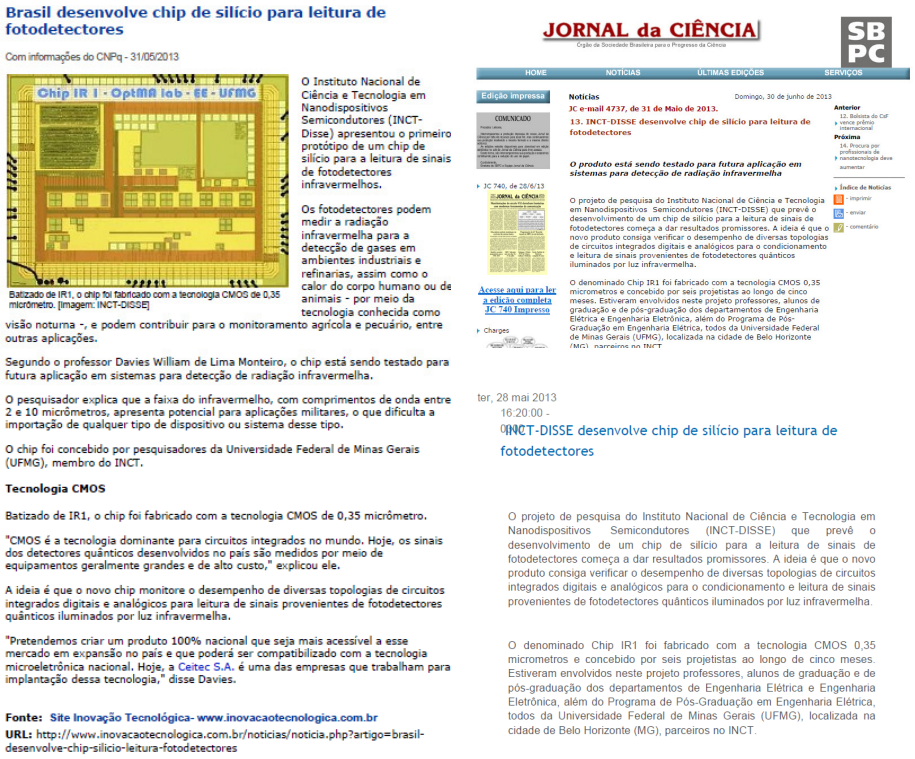
NANODISPOSITIVOS SEMICONDUTORES

DISSE

DISSE on the Media

Development of chip for read-outs of photodetectors was on the news





- CNPq news
- Jornal da Ciência
- Inovação Tecnológica

http://www.jornaldaciencia.org.br/Detalhe.jsp?id=87323
http://www.inovacaotecnologica.com.br/noticias/noticia.php?artigo=brasil-desenvolve-chip-silicio-leitura-fotodetectores&id=010110130531

Knowledge transfer to industry and government offices

Partners:

Investing in our development of infrared photodetectors for infrared cameras operating in the SWIR with financial support.

Joint project on infrared imaging, detectors delivered

Joint project with scholarship

IGAL Lentes **Project on electrochromatic films**

Cooperation on the evaluation of radiation hardness of semiconductor devices, in special, infrared sensors

Personnel for free space optical communication testing

Ministério da Defesa, Pró-defesa

Association with National Labs

- ***LABDIS (SisNano)***
- ***LANano (SisNano)***
- ***Rede Brasileira de Pesquisa e Instrumentação em Nanoespectroscopia Óptica***

INSTITUTO NACIONAL DE CIÊNCIA E TECNOLOGIA
NANODISPOSITIVOS SEMICONDUTORES

Involvement with public policies

Actions undetaken to build an infrastructure in the country for the production of infrared photodetectors:

JOINT VENTURE BETWEEN GOVERNEMENT AGENCIES AND COMPANIES INTERMEDIATED BY INCT-DISSE

1) Proposal of creation of an Innovation Institute in Defense together with SENAI

- *Area of sensors responsability of INCT-DISSE*
- *Discussions with SENAI, Ministery of Defense and FIESP*
- *Companies that have participated in the discussions: Mectron, Opto Eletrônica, Equatorial Sistemas, Optsensys, Navcon, Orbital e Luxtec.*

2) Proposal of the installation of a pilot plant for the development of infrared photodetectors and solar cells at Parque Tecnológico, São José dos Campos

- *Operation feasibility*
- *Project elaboration*
- *INCT-DISSE, Parque Tecnológico São José dos Campos, AEB, MD, Orbital*

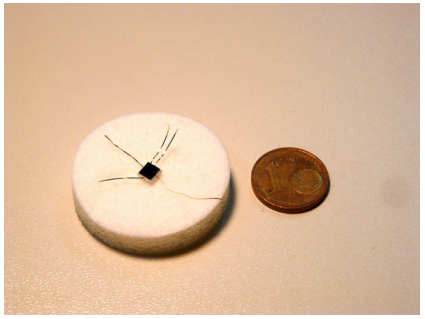
PARQUE TECNOLÓGICO São José dos Campos
INOVAÇÃO SEM LIMITES
NO BORDERS FOR INNOVATION

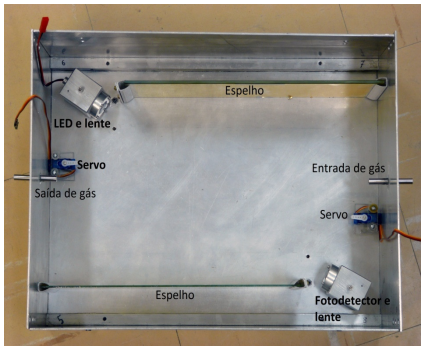
ORBITAL ENGENHARIA

MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
AEB AGÊNCIA ESPACIAL BRASILEIRA

Knowledge transfer to industry and government offices

Technological products/technology transfer



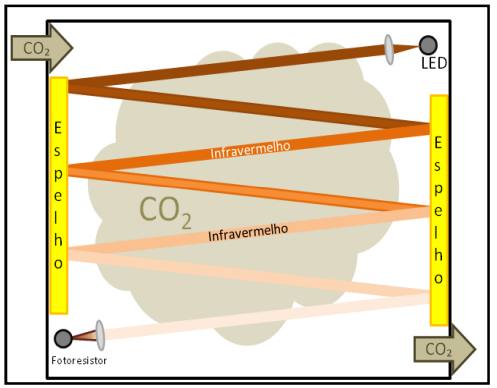


1) QWIPs developed for CTEx and prototypes delivered

2) Equipment for gas detection

3) Software development:

• *Computational tool for designing lithographic masks for silicon convex microlenses,* Davies William de Lima Monteiro, junho 2009.
• *Quantum Well Software* – version 4, Angelo Passaro, Wellington Palma Gonçalves, Roberto Yuji Tanaka, Nancy Mieko Abe, J. M. Villas-Boas, QWS v4, 2010.
• *Integrated tool for optimization of circuit parameters of components of integrated circuits,* Pablo Nunes Agra Belmonte, setembro 2012.
•*μCavitySim*, Eduardo Adriano Cotta, Omar Paranaiba Vilela Neto, Fernando Carvalho Coelho e Eduardo Cesar Pimenta Ribeiro, 2013.



4) Granted patents:

• *Método e aparato otimizador de eficiência de LEDs orgânicos***.**
• *Método Otimizador de Desempenho de Células Solares e Aparato Otimizador de Desempenho.*

5) Deposited patentes:

• *Dispositivo maciço encapado com nanocone de carbono para microscopia e espectroscopia por varredura de sonda*
• *Dispositivo maciço com extremidade unidimensional para microscopia e espectroscopia por varredura de sonda*

Cooperation with other INCTs

- **INCT INEO of Organic Electronics**

Conjugated polymers semiconductor devices (Luiz Alberto Cury) and on Computational Intelligence (Marco Cremona)

- **INCT of Quantum Information**

Photodetectors for free space optical communication (Jean Pierre von der Weid, Guilherme Temporão e Guilherme Xavier)

- **INCT FOTONICOM of Photonics for Optical Communication**

Growth of semiconductor structures and use of processing facilities (Newton Frateschi)

- **INCT NAMITEC of Micro and Nanoelectronic Systems**

Site-controlled nucleation of quantum dots of III-V semiconductors (Rodrigo Prioli) and on CMOS chip 0.35 μm integrated circuit (Petraglia and Gomes)

- ***INCT Carbon Nanomaterials***

Carbon nanotubes for photosensitive devices (Marcos Pimenta)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Scientific and technological output

- **Books 2**
- **Chapter of a book 1**
- **Scientific international journals 69**
- **Scientific national journals 3**
- **Presentations in international conferences 73**
- **Presentaions in national conferences 63**
- **Softwares 4**
- **Patents 4**

Main publications

• *Robust states in semiconductor quantum dot molecules*, H. S. Borges *et al*, Physical Review. B, **81**, 075322, (2010).
• *Self-Assembly Quantum Dots Growth Prediction by Quantum-Inspired Linear Genetic Programming*, Douglas Mota Dias *et al* "IEEE Congress on Evolutionary Computation" CEC2011, New Orleans, USA (2011).
• *Atomically resolved study of the morphological change of InAs/GaAs quantum dots layers by rapid thermal annealing*, J.G. Keizer *et al*, Applied Physics Letters **101**, 243113 (2012).
• *Exceptionally narrow band quantum dot infrared photodetector*, D. Alvarenga *et al*, IEEE Journal of Quantum Electronics, **48**,1360-1366 (2012).
• *Asymmetry tuning of Fano resonances in GaAs photonic crystal cavities*, P. T. Valentim *et al*, Applied Physics Letters, **102**, 111112 (2013).

Main technological products:

• *Detectores QWIPs fornecidos ao Exército, Rudy Kawabata et al (2012).*
• *Chips para read-out de fotodetectores, Davies William Lima Monteiro et al (2012).*
• *Sistema de detecção de gases tóxicos, Guilherme Torelly et al (2013).*