E.U. Projects at Thales Research and Technology (TRT)

Department of semiconductor components and technology
Domaine de Corbeville, 91404 Orsay Cedex

Theme: Quantum Cascade Lasers

Project leader: Hideaki Page

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My Background

5th Framework projects

UNISEL (STREP)	co-ordinator	Thales
SUPERSMILE (STREP)	co-ordinator	Technical University of Vienna
WANTED (STREP)	co-ordinator	Cavendish labs

ANSWER

Artifical Nano-materials for Short Wavelength Emission in the Infrared

Call: NMP nanotechnology and multifunctional materials

STREP Start date:	1-2-2004
Duration:	3 years
Total Funding:	1.8Meuros

Thematic area 3, Nanotechnology, knowledge based multifunctonal materials, new production processes and devices”,
3.4.2 knowledge based multifunctional materials.
3.4.2.1 Development of fundamental knowledge
3.4.2.3 Engineering support for materials design

Consortium

Thales Research and Technology	France
University of Neuchatel	Switzerland
Alpes Laser (SME)	Switzeland
Fraunhoffer Institute	Germany
University of Sheffield	UK
University of Paris VII	France
INFM Bari	Italy
Technical University of Vienna	Austria

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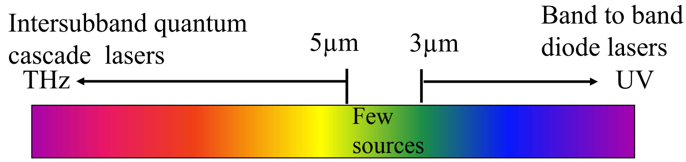
Réunion nationale d’information sur le programme NMP 13-1-2005 THALES

The Problem



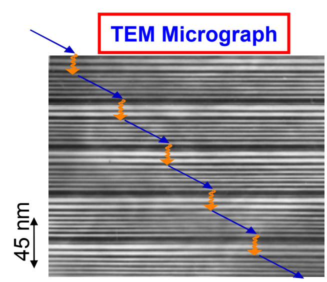
Wavelength

Wavelength	T_{max} (pulsed)	T_{max}(CW)	Date
3.5µm	280K	50K	1998
4.6µm	320K	110K	2002

Goal: 3-5µm band room temperature quantum cascade lasers

The ANSWER to the call

Semiconductor nano-technology

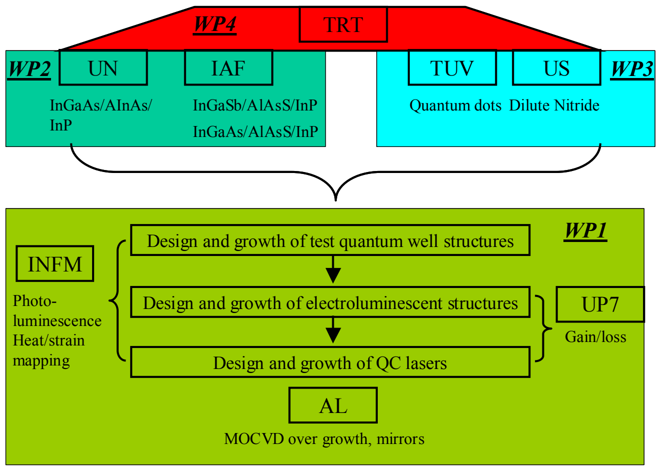


quantum cascade laser

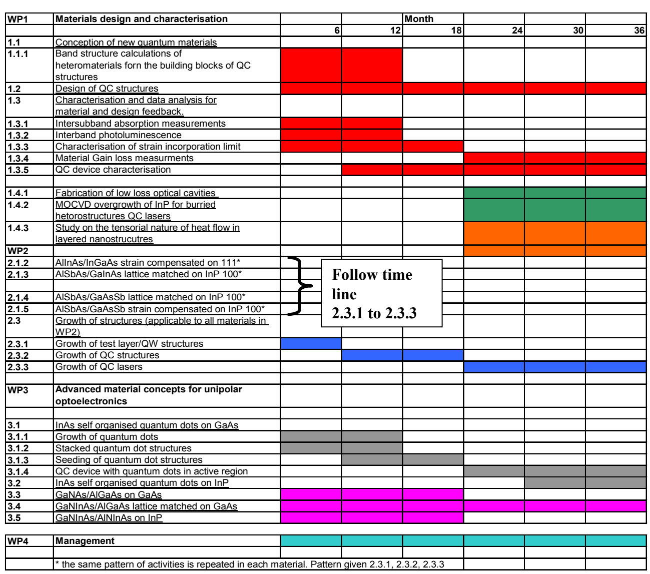
New semiconductor materials = new lasers

Short term concepts	Strain balance InGaAs/AlInAs on InP
Medium term concepts	InGaAs/AlAsSb on InP
Long term	Quantum dots and dilute nitrides

Flow Diagram



Gantt Chart



Evaluation Summary Report for a STREP

Proposal No. : 505642-1	Acronym : ANSWER

1. Relevance *(Threshold 3/5; Weight 1)* The development of new class QC LASERS have objectives well aligned with the NMP priority.	**Mark:** 4
2. Potential impact *(Threshold 3/5; Weight 1)* There is sufficient expertise in the project for succeeding in the development of new devices of LASERS in the 3-4µm wavelength range. If successful, an important impact in free space communication and spectroscopic trace gas detection applications is expected.	**Mark:** 4.3
3. S&T excellence *(Threshold 4/5; Weight 1)* Project tasks and objectives are clearly defined in the project work programme to be carried out by highly specified and skilled partners. However, more detailed and measurable milestones are to be set.	**Mark:** 4.3
4. Quality of the consortium *(Threshold 3/5; Weight 1)* The consortium is of high quality. Partners expertise and skills in the field are expected to result successfully in bringing a competitive edge to EU in the field of LASERs using new design and materials.	**Mark:** 3.8
5. Quality of the management *(Threshold 3/5; Weight 1)* Better integration of effort and its distribution across the work packages should be achieved more effectively. IPR and exploitation of technology issues need to be further addressed by the partners.	**Mark:** 3.5
6. Mobilisation of the resources *(Threshold 3/5; Weight 1)* Almost all partners are able to design,analyse and characterise new devices. Therezfor a better integration and focus on potentially important devices are recommended. This will also avoid the duplication of effort in work packages, especially in WP1. WP4 (services work) by AL+INFM+TUV that is not clearly justified.	**Mark:** 3.4
Overall remarks *(Threshold 21/30)* The proposal is recommended for its scientific and potential impact. It could however be more focused, hereby also limiting the scope and resources of this basic research phase. An overall budget reduction of 35% resulting in a maximum recommended funding of 1.800.000 should thereby be achieved.	**Total score:** 23.3

Has the proposal passed all evaluation thresholds?	**Yes**
Does this proposal have ethical issues that need further attention?	**No**

Negotiations

Requested budget 2.7 Meuros

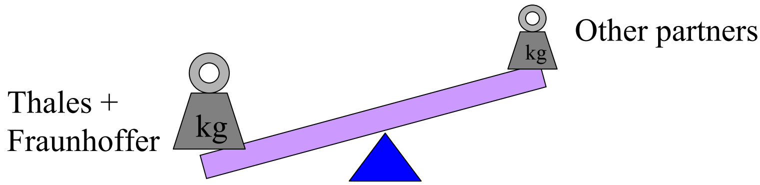
After E.U. demands 1.8 Meuros

Budget pre-written by project officier
No choice take it or leave it

However, reduced deliverables and targets

Lessons

Too many big players in the consortium demand a large share of the budget



Be prepared for a reduced budget ~20-35%

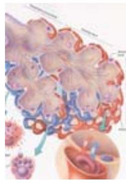
Reporting in 6th Framework more demanding than in 5th Framework

EXCELS

Exhaled breath analysis of Complex bio-molecules Elucidated by Laser Spectroscopy

TRT	France
Sheffield	UK
Alpes	Switzerland
Paris VII	France
Vigo	Poland
LENS	Italy
Leipzig	Germany

EXCELS Overview



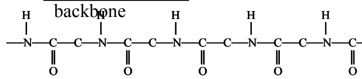
Exhaled Breath
Gas NO, CO_2, etc

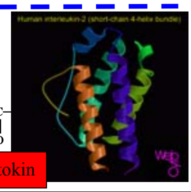
Moisture, Aerosols, dissolved gases and compounds

Complex biological compounds: Cytokines, arachidonate metabolites, Cyclooxygenase, DNA

Man Machine interface

Protein backbone





Cytokine

Broad mid-infrared absorption bands

	Coil	Helix	Sheet	
Amide A	3250 cm^{-1}	3290 cm^{-1}	3290-3260 cm^{-1}	NH stretch
	3.077 µm	3.040 µm	3.040-3.067 µm	
Amide I	1655 cm^{-1}	1650 cm^{-1}	1630 cm^{-1}	C=0 stretch
	6.006 µm	6.024 µm	6.135 µm	
Amide II	1520-1545 cm^{-1}	1545-1550 cm^{-1}	1520-1530 cm^{-1}	C-N stretch NH bend
	6.579-6.472 µm	6.472-6.452 µm	6.579-6.534 µm	

STREP EXCLES EVALUATION SUMMARY REPORT

1 .Relevance (Threshold 3/5) 2
The proposal represents a nice work on the spectroscopic analysis of exhaled breath for diagnostic healthcare. Nevertheless no biosensors development is presented. IST-NMP priorities are not addressed.

2. Potential Impact (Threshold 3/5) 3
This project could have impact on competitiveness in its field but not in that ofbiosensors. The structure and the detection of the complex biomolecules depends on several parameters like pH, humidity, the function of alveolar macrophages etc. and all those should be considered to the interpretation of the analytical results so as to preview their real impact. Issues on reinforcing competitiveness of SMEs are not addressed. The European added values are clear but the exploitation plans are not described well.

3. S and T Excellence (Threshold 4/5) 4
The first part of the project focuses on the laser spectroscopy of the analytes and it isclearly defined and with well focused objectives. Nevertheless the proposed special spectroscopic method seems to require more basic research before being of use in this project. In the second part of the project the limitations of the structure analysis of cytokines need further considerations before the medical or biological relevance of the objectives can be justified. WP3 is not thoroughly developed.

4. Quality of consortium (Threshold 3/5) 4
The quality of the consortium is high. The complementarities of the team would be improved by the incorporation of protein / peptide biochemist to bridge the gap between laser physicist and medical experts on lung diseases or intensive care specialists. SMEs in the field of laser technology are involved in the project.

5. Quality of management (Threshold 3/5) 4
The management of the project is appropriate. The IPR issues are not outlined.

6. Mobilisation resources (Threshold 3/5) 4
The mobilization of resources is described in details. Less effort is included to have sufficient competence in the interpretation of the protein structure data in terms of diagnostic results.

Overall remarks (Threshold 21/30)