Françoise Remacle

FNRS Director of Research at ULiege

Theoretical Physical Chemistry

Research Unit : MolSys

FUNDING OPPORTUNITIES

FUTURE & EMERGING TECHNOLOGIES

European Commission

HORIZON 2020

COPAC

Coherent Optical PArallel Computing

http://copac-fet.eu/

November 1, 2017-October 30, 2020

H2020-EU.1.2.1. - FET Open Project ID : 766563

Experience as a coordinator of FET projects

FP6 : FET Open Project **MOLDYNLOGIC**

2005-2008

FP7 : FET Proactive **MOLOC**

2008-2011

FET Proactive **MULTI**

2012-2016

H2020: FET open **COPAC**

2017-2020

Partner : FP7 FET Proactive **TOLOP** 2012-2016

FP7 FET Open **BAMBI** 2014-2016

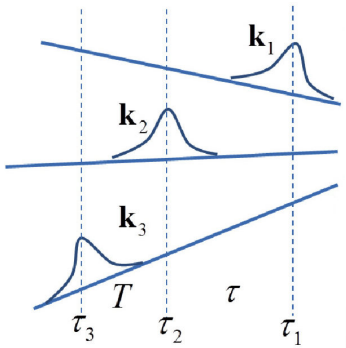
COPAC
Coherent Optical PArallel Computing

1. Summarize the concept of the project as a cartoon

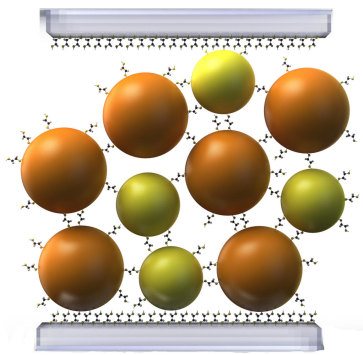
Coherent Optical PArallel Computing

by ultrafast laser addressing, quantum engineered information processing and macro readout of semi-conducting quantum dot arrays.

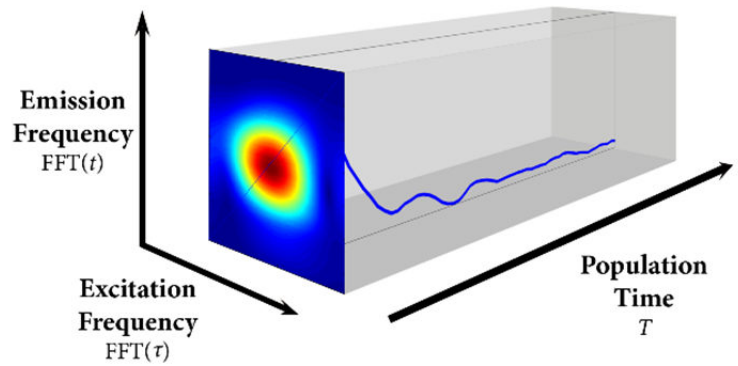
Addressing by fs laser pulses



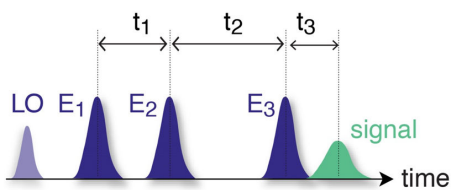
Non linear optical response of QD arrays

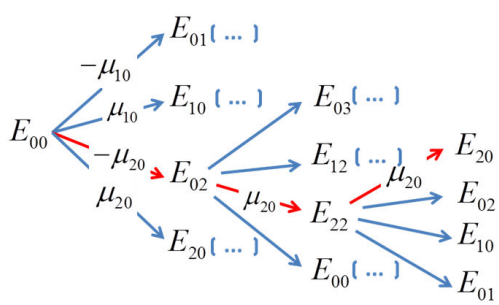


Macroscopic read out

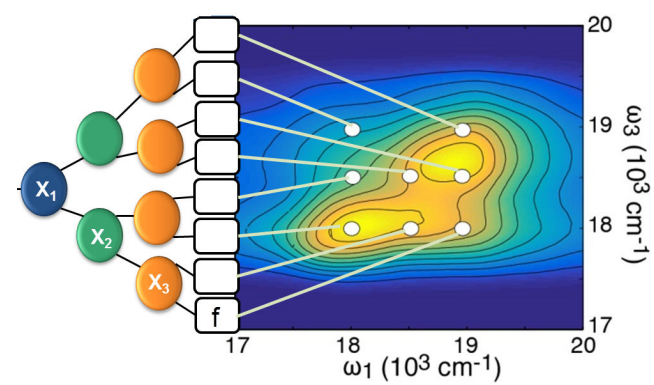


Information processing by quantum dynamics of observables (**populations AND coherences)**



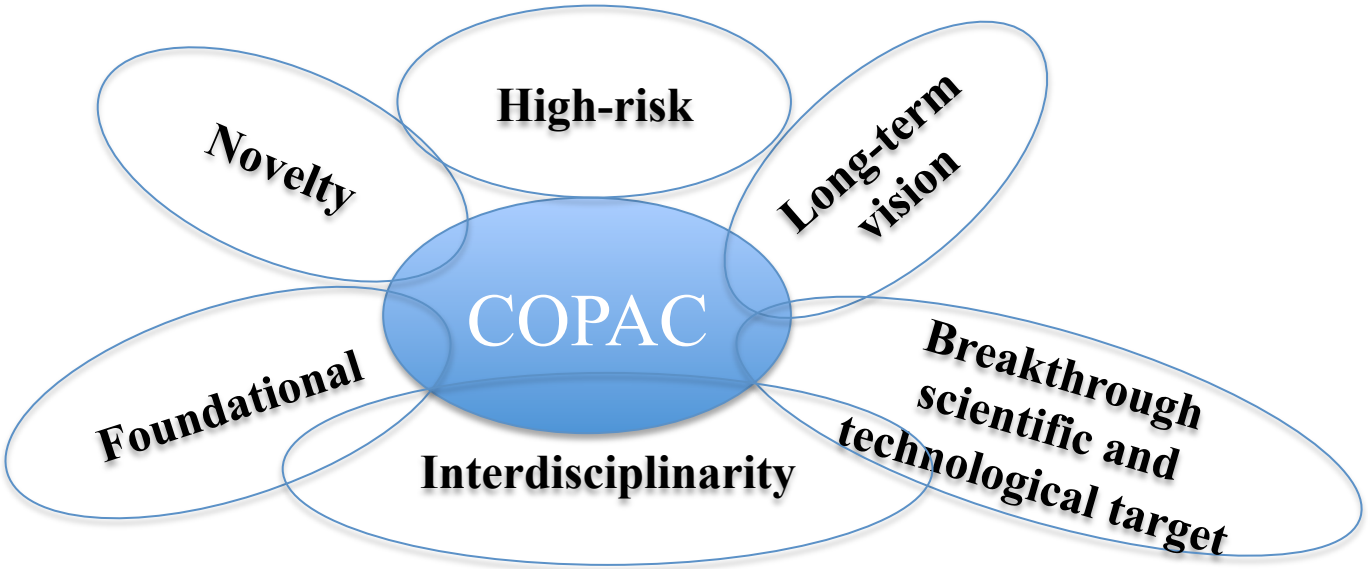


Parallel logic implementation of transforms



COPAC
Coherent Optical PArallel Computing

2. Does you project satisfies the 6 FET open gate keepers?



Remember that in H2020

- FET is no longer restricted to ICT.

-The breakthrough should be part of a long term vision that would enable a **new technology.**

Make clear reference to the gate keepers in the three sections of the proposal

- **Excellence**
- **Impact**
- **Implementation**

Go to the guidelines with the definition of the gate keepers

Long-term vision: the research proposed must address a new and radical long-term vision of a science-and technology-enabled future that is far beyond the state of the art and not currently foreseen by technology roadmaps.

Breakthrough scientific and technological target: research must target a scientifically ambitious and technologically concrete breakthrough, argued to be a crucial step towards achieving the long-term vision. The plausibility of the proposed breakthrough(s) to be attained within the life-time of the project must be argued in the proposal.

Novelty: the research proposed for achieving the breakthrough must be based on cutting-edge knowledge, new ideas and concepts, rather than in the mere application or incremental refinement of existing ones.

Foundational: the breakthroughs that are envisaged must be foundational in the sense that, if achieved, they would establish an essential basis for a new kind of technology and its future uses, not currently anticipated.

High-risk: the inherently high risk of the research proposed will be reflected in a flexible but effective methodology for exploring alternative directions and options, supported by open and agile research and innovation practices.

Interdisciplinary: the proposed collaborations are expected to go beyond 'waterfall' configurations in multi-disciplinary science and technology research. Instead they should seek new solutions through genuine exchanges, mutual learning, cross-fertilisation and synergistic advances among distant disciplines in order to open unexplored areas of investigation and new directions for joint research.

Concept

COPAC
Coherent Optical PArallel Computing

Coherent Optical PArallel Computing

by ultrafast laser addressing, quantum engineered information processing and macro readout of semi-conducting quantum dot arrays.

Long term vision

'COPAC long-term vision is to firmly establish a new paradigm, and hardware and software technologies for the implementation at room temperature of ultrafast and complex parallel logic operations on arrays of quantum engineered nanomaterials that are addressed and read macroscopically.'

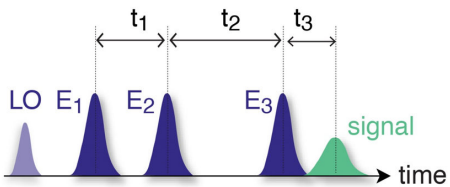
Targeted Breakthrough

' Our targeted breakthrough is a novel prototype device for parallel logic engineered to industry standards and with suitable compilers.'

Do this exercise for each of the gate keepers, they appear as subsections of Section 1 'Excellence' in the template of Part B of proposal.

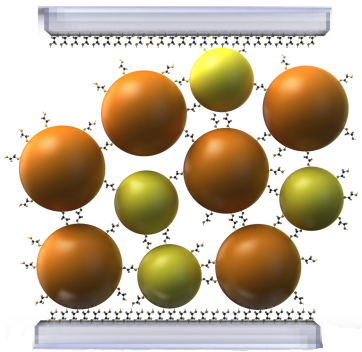
3. Build a consortium that is credible for achieving the objectives of the project

Ultrafast non linear optics



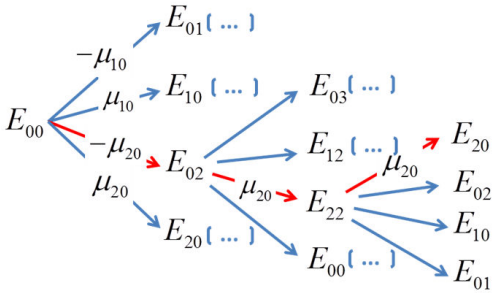
- fs laser addressing
- 3D electronic spectroscopy
- multi phase matching
- macroscopic reading

Material science



- QD synthesis
- QD assembly
- QD characterization
- Device engineering
- Device packing

Theory and simulation



-Theory and simulation of the dynamics of the optical response of the device

-Theory of computing in parallel with quantum mechanical observables

-Design of compilers

- Bring the **relevant** expertise, identify the role of each partner in the project (makes it easier to write the workplan).
- The consortium must be well integrated and work as a team already at the stage of the writing the proposal.
- Have a core of partners with whom you are used to collaborate (ideally in previous FET projects).

COPAC
Coherent Optical PArallel Computing

Consortium

Coordinator:
University of Liège **(ULiege)** Belgium. Françoise Remacle (Theory)

Partners :
-Hebrew University of Jerusalem Israel **(HUJI)**. Raphael D. Levine (Theory),Yossi Paltiel (Optical properties of QD arrays).

-University of Padova **(UNIPD)** Italy. Elisabetta Collini (Non linear optical spectroscopy), Barbara Fresch (Theory).

-Italian National Research Council (**CNR-Bari)** Marinella Stricolli (Synthesis of QD and QD arrays).

-ProbaYes Software (**PB**), Grenoble, France. David Herrera-Marti (Compilers for unconventional hardwares).

- ELBIT Systems (**ELBIT**), Tel-Aviv, Israel. Ariel Donval (Engineering of Optical devices).

COPAC
Coherent Optical PArallel Computing

Highly multidisciplinary consortium

In COPAC most of the partners are familiar with the concept underlying the project :
They have already worked in the field of molecular logic and its implementation using the dynamics of the response to light stimuli.

All the COPAC partners have worked together before in multi and bilateral projects.

Several partners have already worked together in FET projects.

It is important that the coordinator masters the essentials of all the aspects of the project.

4. Identify the impacts

- Transformational impact of the new technological outcome in technology and/or society

- *Measures for achieving impact in science, technology and or society*

  -Dissemination and exploitation of the results
  -Data management
  -Knowledge management and protection – Patenting

- Empowerment of new and high potential actors towards future technological leadership.

COPAC
Coherent Optical PArallel Computing

5. Implementation : Establish a credible workplan

- that matches the objectives of the project
- where the expertise of the partners is used at the right place

Discussions and face to face meetings are very important at this stage.

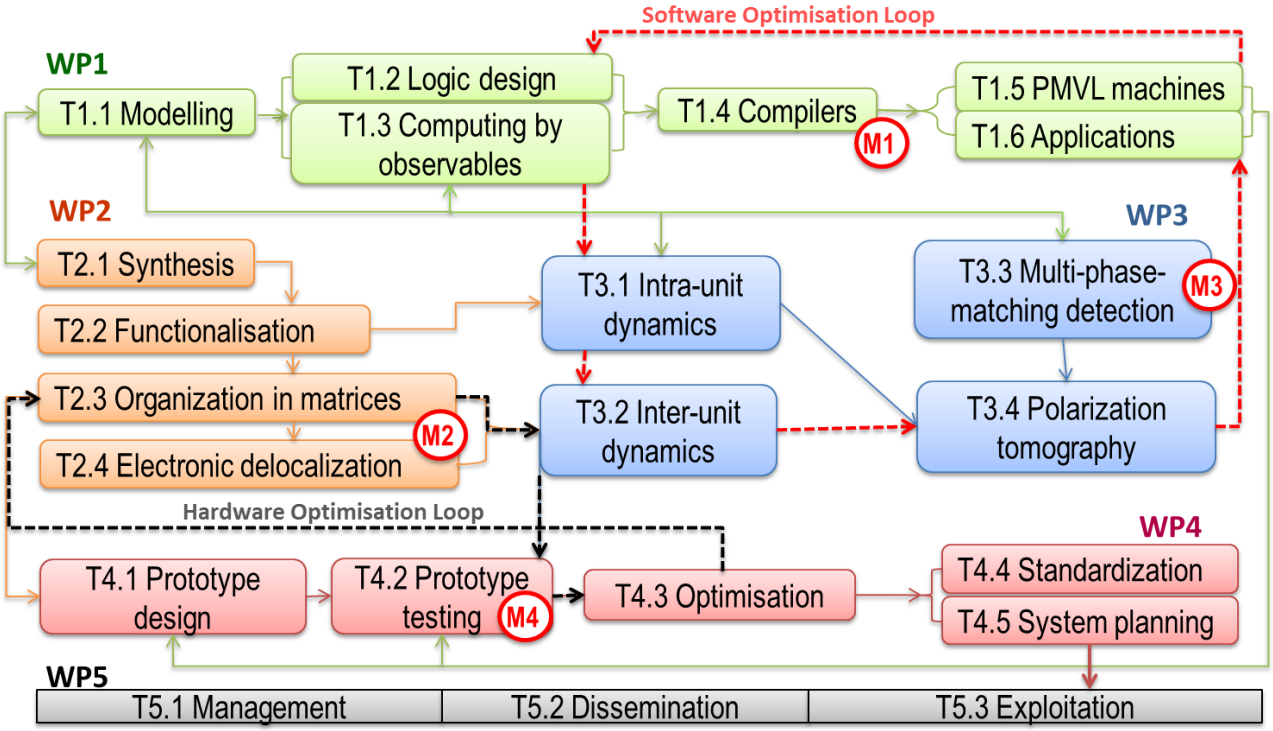
Give a lot of attention to the organization of the work packages and their interactions (Pert and Gantt diagrams are useful summaries).

- Objectives, Tasks, Deliverables, Milestones

- Adequate timing, Who does what and in which order.

COPAC
Coherent Optical PArallel Computing

a)



b)

	M6	M12	M18	M24	M30	M36
WP1 : Theory, modeling, logic design, software and						
T1.1						
T1.2						
T1.3						
T1.4						
T1.5						
T1.6						
WP2 : Design, synthesis and characterization of dot arrays						
T2.1						
T2.2						
T2.3						
T2.4						
WP3 : Parallel logic by non linear optics						
T3.1						
T3.2						
T3.3						
T3.4						
WP4 : Device engineering						
T4.1						
T4.2						
T4.3						
T4.4						
T4.5						
WP5 : Management, dissemination, exploitation						
T5.1						
T5.2						
T5.3						

6. Writing of the proposal

- Follow carefully the guidelines and the instructions of the template.
- Select the right keywords (both the predefined and the free keywords)
- Give attention to all the sections, even those with less weight in the final score or lower thresholds.

  -Excellence : threshold 4/5 , weight 60%
  -Impact : threshold 3.5/5, weight 20%
  -Implementation : threshold 3/5, weight 20%

To be successful, one needs a score close to 5 in the final mark!

- The part B of the proposal is made of two parts
  - Sections 1-3 : Excellence, Impact, Implementation
    -Tight length limit, keep the essential, be clear, add schemes and figures.
  - Section 4 : Description of the beneficiaries
    NO length limit. One can add here in the description of the partners more details about the technics that will be used, the expertise of the partners, the management etc...
  - Section 5 : Ethics. Give attention.

6. Writing of the proposal

- **Start writing early** and have as many discussions and interactions as possible with the partners to optimize all the details and be consistent at all levels.
- **Seek advices** and support from your R&D department and those of the partners.
- **Get feed back** : Critical readings and comments are the most important.

Good luck!

Thank you for your attention