Co-financing R&D - a win-win opportunity

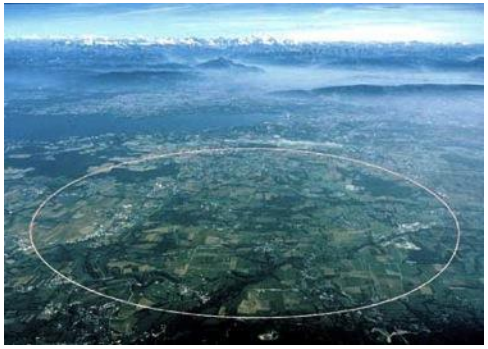
Jean Luc Lancelot, Sigmaphi and PIGES
Thierry Hovsepian – Alsyom
Stephane Bethuys – Thales
Thomas Parias - Sominex

- Sigmaphi presentation
- Piges presentation
- Examples of fruitful cofinanced R and D projects
- Conclusion: conditions for success

Equipments for particle accelerators

2 main sectors

- Physics research labs



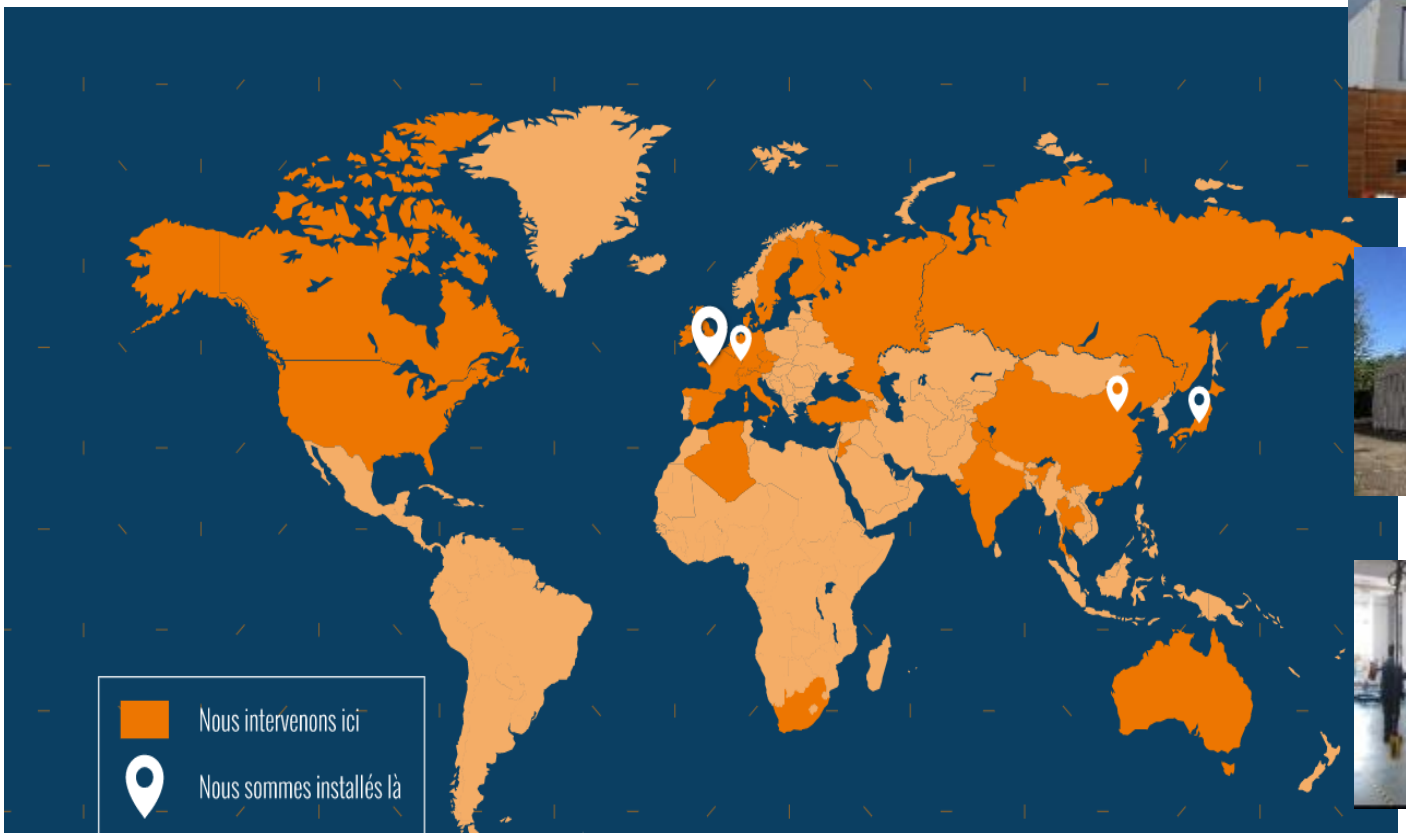
CERN-LHC

ESRF

Jefferson Lab

- Hadrontherapy centers manufacturers

SIGMAPHI
ACCELERATOR TECHNOLOGIES



Sigmaphi Magnets, Brittany

Sigmaphi Electronics, Alsace

Sigmaphi China

Sigmaphi Japan

30 M€, 90% export, 180 people

The PIGES association

www.piges.eu

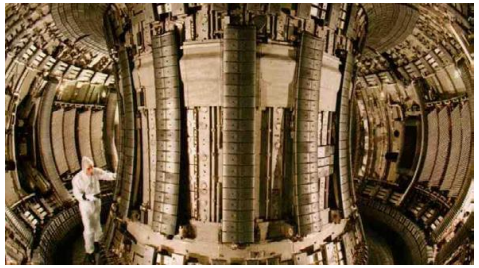
contact@piges.eu

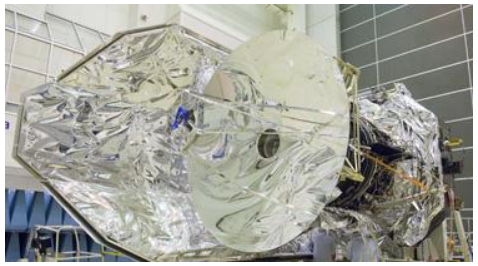
Piges is an association created in 2010 gathering French companies involved in Large Scale Research Infrastructures

- To promote their activities
- To enhance links with research labs (training…)
- To initiate common R&D programs with Research Institutes
- To liaise with French administration

PIGES

- Adressing:
  - Accelerators
  - Biology and Medecine
  - Nuclear Energy: Fusion and Fission reactors
  - Space programs
  - Astrophysics
  - High power lasers



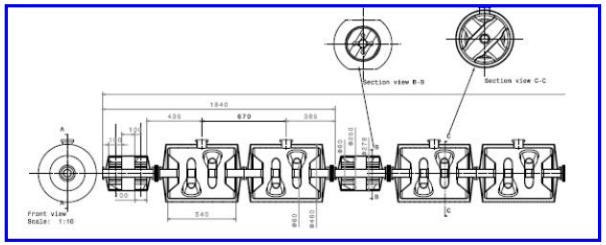


❖A glance at our know-how and references

PIGES

ACCELERATORS AND CRYOGENIC SYSTEMS

General accelerators and cryogenics systems conceptual studies



Air Liquide
creative oxygen

Helium liquefaction and refrigeration systems (1.8K – 80 K)

ALCEN

Innovative solutions for Research Infrastructures

PIGES

Bodycote

Heat treatment and Brazing

CNIM
Innovate and Act

Manufacturing of large mechanical components

MECACHROME

High precision machining

PIGES

sdms
la chaudronnerie blanche

Manufacturing of welded mechanical assemblies and components from noble materials

SIGMAPHI
ACCELERATOR TECHNOLOGIES

Magnets, beamlines and electronics for particle accelerators

SOMINEX
global solution provider

Supplier of vacuum chambers and precision engineering for particle accelerators

PIGES

Symétrie

High precision hexapods and diffractometers

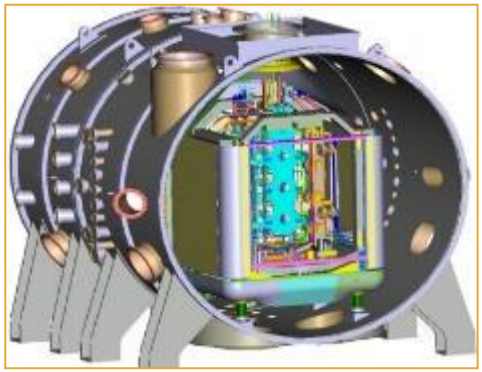
SODERN

Enabling your ambitions

Neutron, optical and space instrumentation

THALES

RF components and systems for Research and Industry



Marty Consultants SARL

Consultancy in fusion technology and risk monitoring

Examples of fruitful cofinanced R and D projects

- Alcen/Alsyom

  CNRS Development of an optomechanical system for Eli

- Sigmaphi

  CEA Development of a small SC cyclotron for isotope production

- Sominex

  BIOS/Gremi plasma based sterilization system

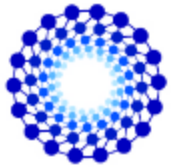
- Thales

  CEA adiabatic bunching system

- Objective:
  - development of a Opto Mechanical System dedicated to generate Gamma Beam from the Interaction between Electron (Accelerator) and Photon (Laser), for the Rumanian ELI Laser Project
- Partners:
  - CNRS / ALSYOM
- Overall cost/lab funding/company funding:
  - CIFRE contract : tripartite agreement between CNRS / ALSYOM / PhD Student ; Employment contract signed between ALSYOM and the PhD Student ; Fees shared between CNRS and ALSYOM

- Long term benefits
  - 1st know how on electron laser interaction
  - New opportunities of collaboration on other topics
  - Increasing of mutual expertise
- Key success factors
  - Strength collaboration between laboratory and industry
  - Combination of research competence of the laboratory and industrial expertise of the industry

❖ Laser / Electron Interaction Point System



PIGES

SIGMAPHI
ACCELERATOR TECHNOLOGIES

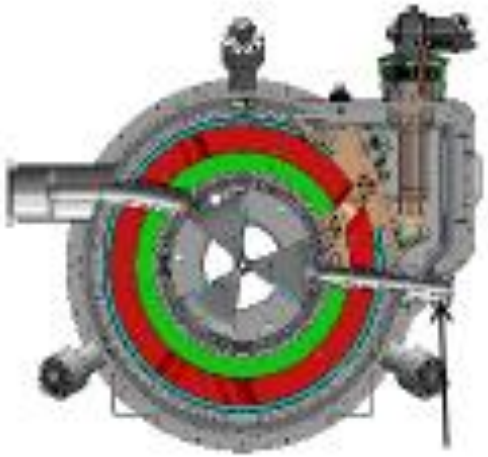
- Objective: develop a small isotope production system based on a superconducting cyclotron
- Partners: CEA/ALCEN/Sigmaphi
- Overall cost > 10 M€.
  - Funding 50% by french R and D ISI program
  - 50% lab funding / company funding
  - Each partner found additional funding
    - Regional authorities
    - Tax credit

SIGMAPHI SUPERCONDUCTING MAGNETS

LOTUS Cyclotron magnet with CEA R&D partnership

Solenoid warm bore 514 mm – 2,36 T – NbTi Helium Free – 100 A – Persistent

2017



- Immediate results of the collaboration
  - For the collaboration
    - Prototype being tested, new markets opening
    - A lot of know how developed
  - For Sigmaphi
    - Opportunity to recruit a young scientist whose thesis was previously cofinanced by CEA and Sigmaphi on another project in a similar field
    - Opportunity to make capital expenditure (test cryostat)
    - Know how (men, design, processes) gained can be used on other applications

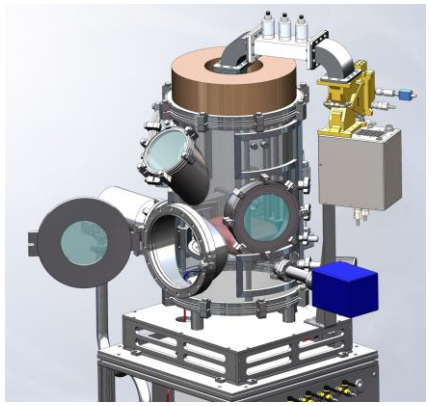
- Long term benefits
  - Quality of the teamwork between CEA and Sigmaphi is a strong basis to do more projects
  - Some publications helped to give more visibility on Sigmaphi R and D capacity in SC magnets
- Key success factors
  - Confidence between people at all levels
  - Respect everybody's know how
  - French tax credit for R and D (CIR)

Plas'Ster Project

- **Objective**: Develop a cold sterilization process based on plasma technology
- CRITT / BIOS Reims / GREMI / Axon Cable / Sominex
- **Overall cost/ lab funding/ company funding**

  2M€ funded 50% by ANR and rest by labs and company
- **Immediate results of the collaboration**

Validation of the sterlization process and development of 3 generation prototypes getting ready for market approval



- **Long term benefits**

Opening of a revolutionary sterilization process allowing the use of many medical tools currently not available because of the lack of effective and non destructive sterilzation pocess

- **Key sucess factors** – combination of expertise and integration of the industrial design skills of Sominex and Axon

THALES

ARIES Workshop

PIGES presentation - THALES example

FEB 6TH 2017

ARIES initiative on high efficient RF solutions

ARIES: Accelerator Research and Innovation for European Science and Industry, 2017...2021

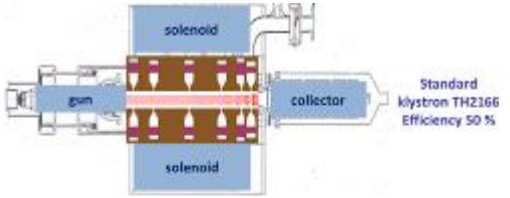
Efficient Energy Management: www.psi.ch/eem

task 1: High Efficiency RF Power Sources (C.Marchand / CEA, R.Ruber / Univ.Uppsala)

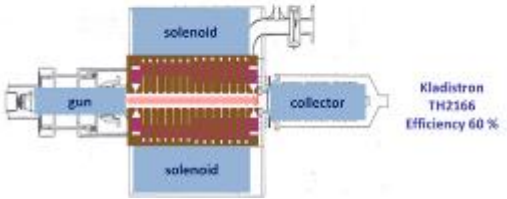
task 2: Increasing energy efficiency by increasing the efficiency of the spallation target station (M.Wohlmuther / PSI, L.Zanini / ESS)

task 3: High Efficiency SRF power conversion (F.Gerigk / CERN)

task 4: Efficient operation of pulsed magnets (P.Spiller, S.Haberer / GSI)



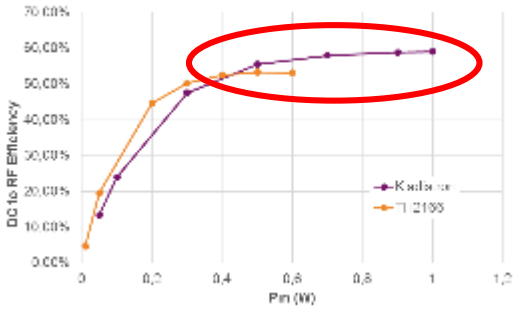
THALES



cea

CEA / THALES initiative on adiabatic bunching method

- **Proof of concept mock-up @ 4.9GHz for design testing.**
- **PhD work funded 50% CEA/50% Thales and supervised by CEA.**
- **THALES manufactures and delivers critical sub-assy and performs pumping and testing.**
- **CEA models and manufactures the klystron body based on adiabatic concept.**

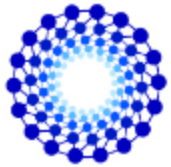


Courtesy : CEA Saclay (C. Marchand, F. Peauger, J. Plouin)

Magic 2D modeling by CEA shows an efficiency increase of +6%

RF conditioning and tests foreseen in Q1 18

THALES



PIGES

THALES

- Benefits for CEA and the scientific community
  - Study new concept at reasonable cost
  - Transfer towards industry and benefit from industry experience for prototype
- Benefits for Thales
  - Leverage R and D effort
  - Pre recruit through thesis cofinancing

Conclusions

- Variety of collaboration types and financing programs
  - ANR (Agence Nationale de la Recherche)
  - BPI (Banque Publique pour l'Investissement)
  - Local/regional public funding
  - Tax credit CIR
  - Company funding
- Even for SME, amounts can be large, several M€

- Benefits
  - Cofinancing leverage : 1 € + 1 € > 2 €
    - Companies can find funding complementing existing one
  - Benefits outside of initial scope
    - Companies develop know how more than a product; Developement of know how in design, processes, capital expenditure can be reused
    - Collaboration practice leads to more collaborations
    - Each organization learns from each other
    - Common publication like posters helps industry to quickly spread out its new know how

- Key success factors
  - Confidence
  - Well balanced work repartition between design and manufacturing –investment (men/equipment…) by companies
  - Well defined IP management
  - Tax credit

- Limits
  - Difficult to finance objects
  - Paperwork and administration may become cumbersome, and sucess rate is too low. Some projects might not be started because of this
  - Companies sometimes restricted to detailed design and manufacture, what is the most difficult to finance; need to balance design work and manufacturing work; the more design, the more company funding

На здоровье АКУЛИНА-2
Cheers ACCULINNA-2