



SOFRADIR
Sensing your future



22/01/2015

MultiKETs Pilot Line Project Final Conference

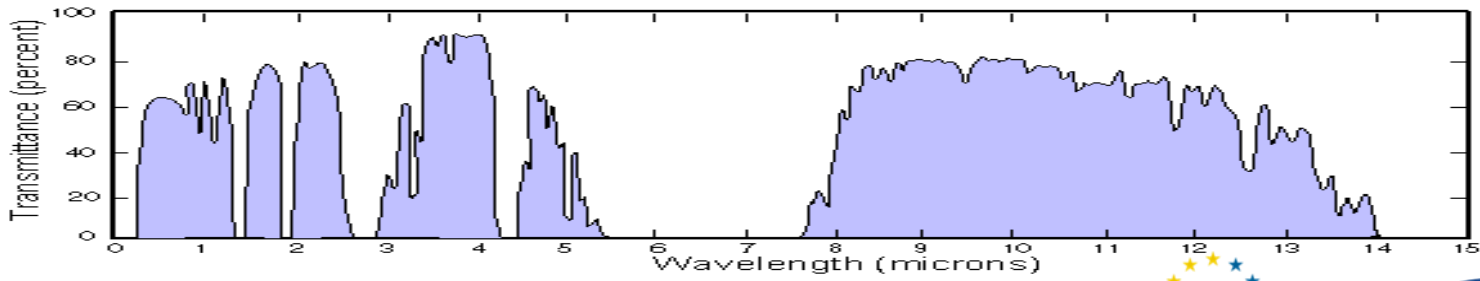
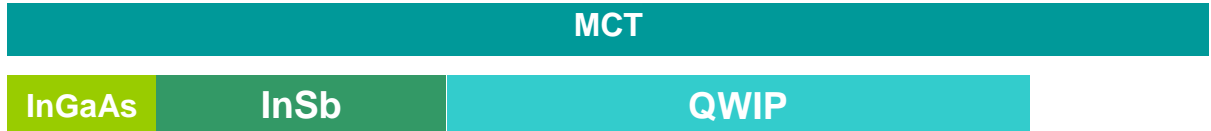
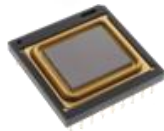




Multi KETs pilot production in medium sized companies

- **The pilot-line production in a medium sized company**
- **The mains hurdles to industrialization**
- **The lesson learned and Sofradir recommendations to other companies**
- **The suitable support from public authorities**
- **The generalization to other sectors**

- **French manufacturer of infrared sensors for military, space and commercial applications**
 - Cooled sensors → Sofradir
 - Uncooled sensors → Ulis (subsidiary of Sofradir)
- **Subsidiary of Thales (50%) and Sagem (50%)**
- **Turnover : about 180 M€ for cooled and uncooled / 750 p**
- **Technologies (for cooled) :**





mKETs Pilot Line Project

To answer to trends of the infrared sensors market

Process in production
MCT n/p

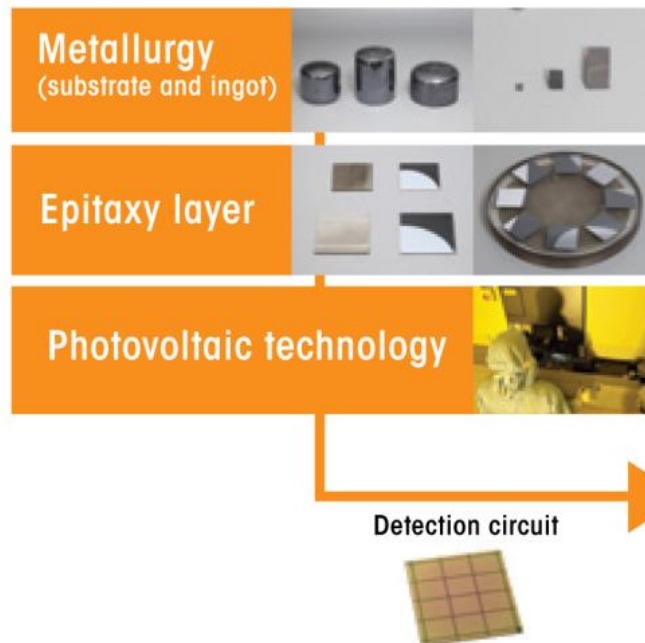


New process
MCT p/n pilot line

MCT material
Ingot diameter : 90 mm

Liquid phase epitaxy

Photodiode processed by
ions implantation.
Polarity n/p



MCT material
Ingot diameter : 115 mm
Improved crystal quality

Liquid phase epitaxy
with doping

Photodiode extrinsic
doping
Polarity p/n

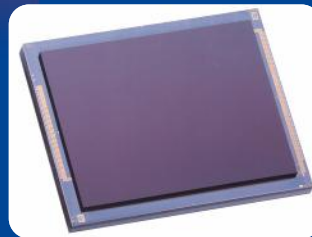


KETs addressed

Advanced Materials



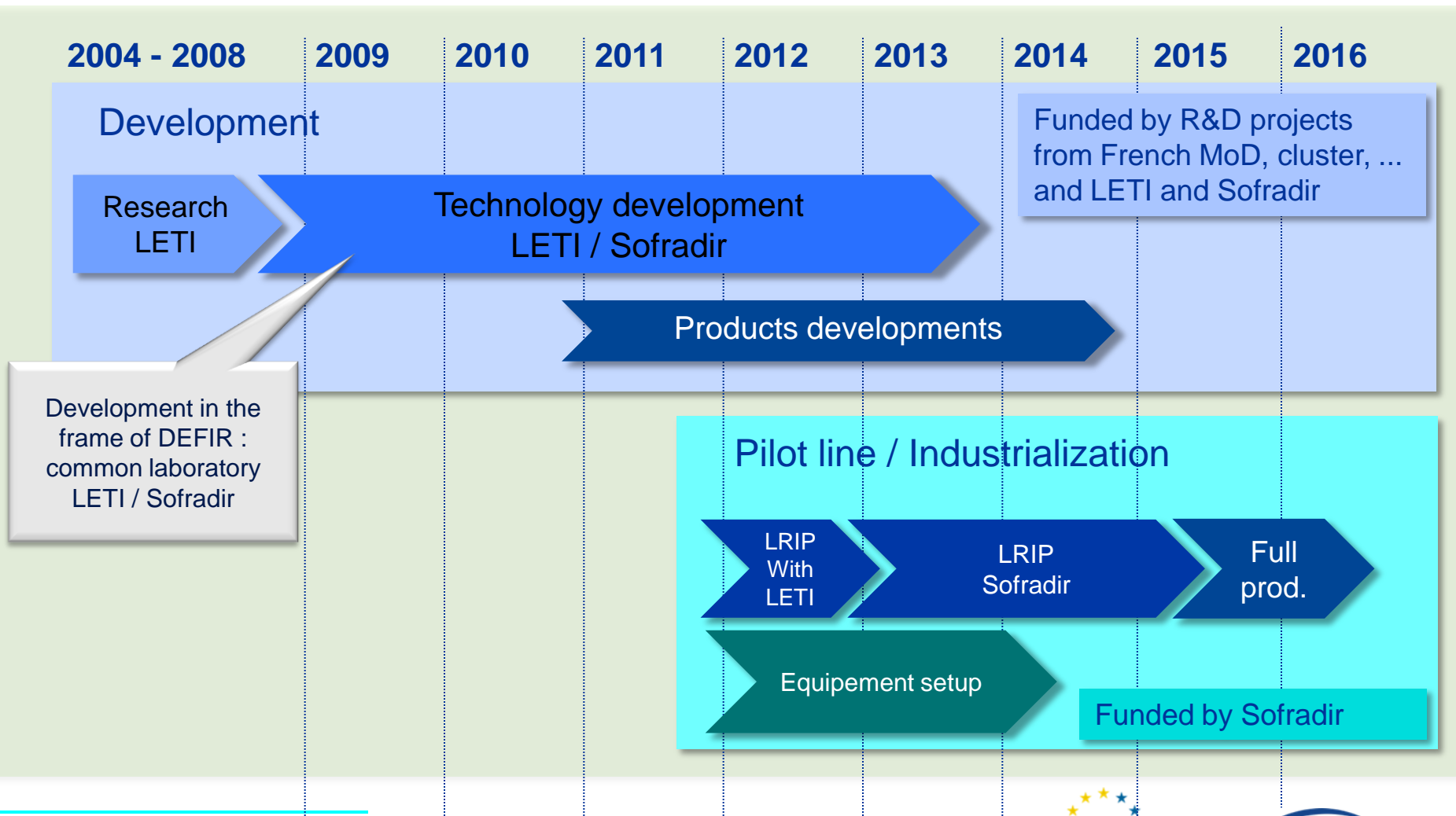
Micro-Nano Electronics



Photonics



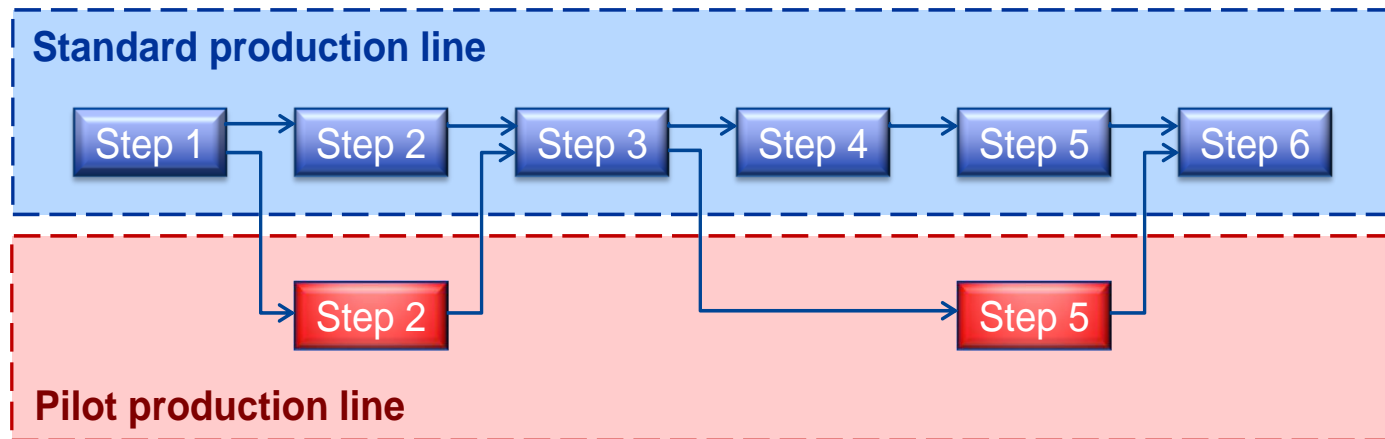
MCT p/n Pilot Line





The pilot-line production in a medium sized company

- Seldom a new facility with new set of equipment (too expensive regarding viability of investment)
- Often an adaptation of the current production line :

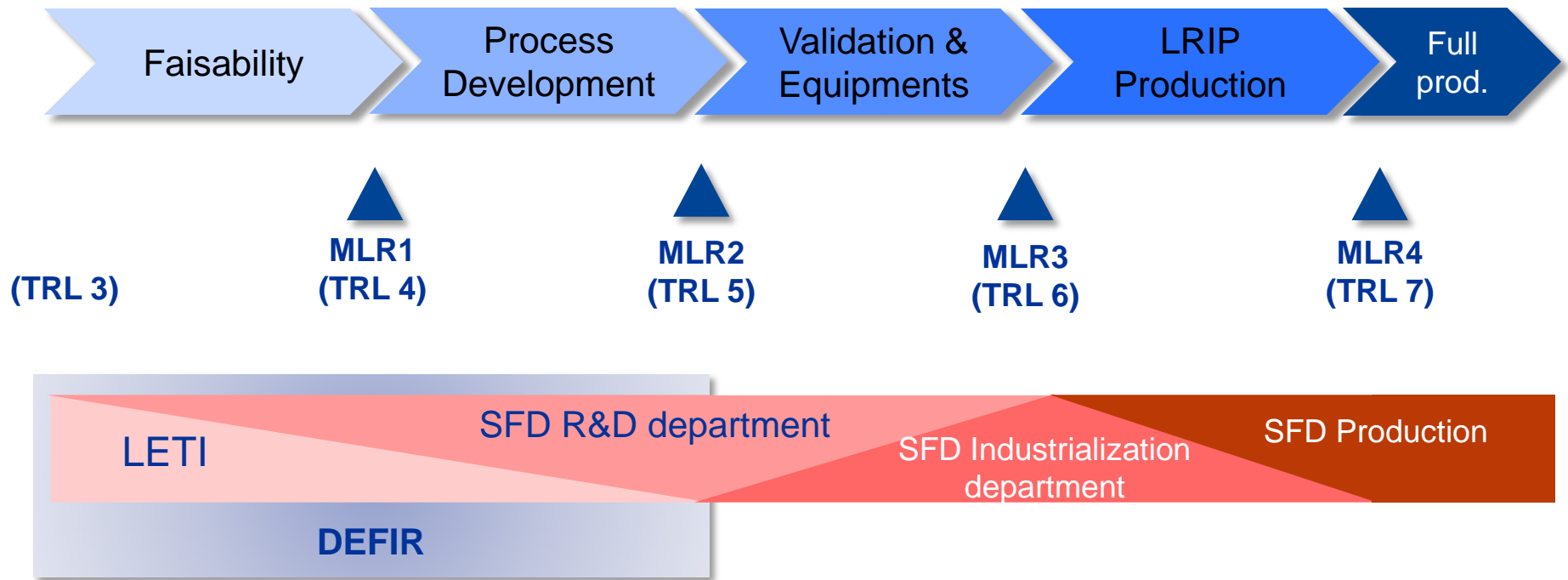


- This was the case at Sofradir for the set up of the MCT p/n pilot line



The pilot-line production in a medium sized company

- The set up of the pilot line at Sofradir is part of larger development process (4 stages / gates process)





The mains hurdles to industrialization for Sofradir

- **Lack of roadmap and reliable market data in case of breakthrough innovation:**
 - Impossibility to define a ROI
 - Impossibility for the management to take a decision about industrialization actions : GO / NOGO
 - Risk of investment is too high regarding the reliability of the market

- **Cost :**
 - Cost of industrialization is the same order of magnitude than the cost of development
 - Financial support are low regarding financial support dedicated to the R&D



The main hurdles to industrialization for Sofradir

- **Lack of communication / coordination between development and industrialization teams:**
 - Development of the new process made without taking into account the industrialization constraints.
 - The risk is to develop a process not compatible with the industrialization !

- **Lack of means : priority is systematically given to the short term actions (production vs industrialization actions)**
 - ➔ Delay : risk to miss the market opportunity or that a competitor catch most of the market



The lesson learned and Sofradir recommendations

➤ Concerning the roadmap and the decision :

- The roadmaps (technology and product) shall be clear and shared by all the stakeholders :
- Find the right balance between techno push and market pull projects (important for the technologies requiring a long time development) :
 - Market pull < 5 years
 - Techno push > 5 years
- ROI shall be computed and regularly updated
- Do not hesitate to stop a development (if obsolete, bad ROI, technical difficulties, ...) !



The lesson learned and Sofradir recommendations

➤ The complete process from the research to the production shall be considered

➔ set up a stage / gate process covering the whole development from the research to the production :

- To have a better control of the process and product development
- To give a better visibility
- To have a common language for all the stakeholders
- To promote communication and cooperation between the teams involved
- To limit the development risks



The lesson learned and Sofradir recommendations

Example of stage / gate process covering the whole development from the research to the production :





The lesson learned and Sofradir recommendations

- **For a fruitful collaboration with a laboratory (R&T phases) :**
 - No competition between research and industrial teams
 - Product and technological roadmap shared and updated every year
 - A global coordination : only two appointed coordinators, one from each partner
 - Facilities and equipments of each other are opened to the other
 - Long term collaboration based on mutual recognition and proximity
 - Clear rules for IP generation and property



The lesson learned and Sofradir recommendations

➤ concerning the organization :

■ Set up a team

- Led by a project manager from the beginning (research) to the production
- With at least one representative of all the functions :
 - ◆ Research
 - ◆ Designer
 - ◆ Industrialization
 - ◆ Production
 - ◆ Quality
 - ◆ Purchase
 - ◆ Cost control
- Role of each member shall be clear



The lesson learned and Sofradir recommendations

➤ Concerning the organization :

- Representative of industrialization and production shall be involved from the beginning (research) :
 - To give their opinion for the technical choices
 - To anticipate the work to be done and equipment to be set up
 - Have veto power from the MLR1

- Transfer is as continuously as possible :
 - Constant interaction between the teams (R&D / Industrialization / production)



The suitable support measures from public authorities

- **For worldwide market limited in volume, the policy of Europe should be to promote one (or few) champion :**
 - To optimize European R&D effort
 - To be competitive regarding Asian and US companies

- **Coordinate European effort concerning all domains :**
 - General (= H2020)
 - Space
 - Military
 - ...



The suitable support measures from public authorities

- **To consider pilot line activity in H2020 program at the same level than the R&D :**
 - Remark : Cost of pilot line activity is similar to the cost on the R&D !
 - Create “**Pilot Line Action**” as the existing “**Research and Innovation Action**” and “**Innovation Action**”
 - Lighten the rules of selection :
 - Pilot Line activity concerns often only one company
 - ➔ Only one actor = only one country



The generalization to other sectors

- **The lesson learned and recommendations described here come from the microelectronic activity**
- **They can be generalize to other KETs domains, eventually with some adjustments**
- **Sofradir would be pleased if the work done in the frame of this project could help the European Commission and some companies to increase the European competitiveness and create job in Europe !**

Thank you for your support and your attention