FOSS for I

Fibre Optics Sensor Systems for Irrigation

UK LEBANON TECH HUB

Presented by Hana Barakat

The Tech Hub

77

Startups

1517

Jobs created

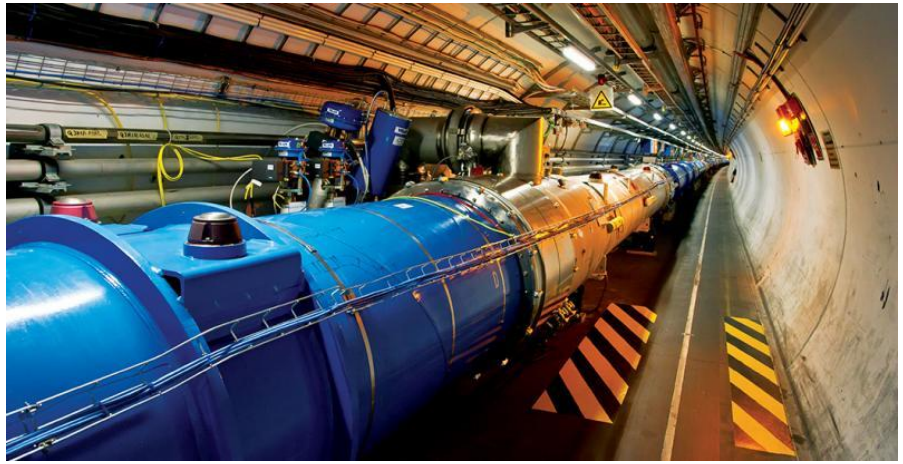
$49M

Raised funds

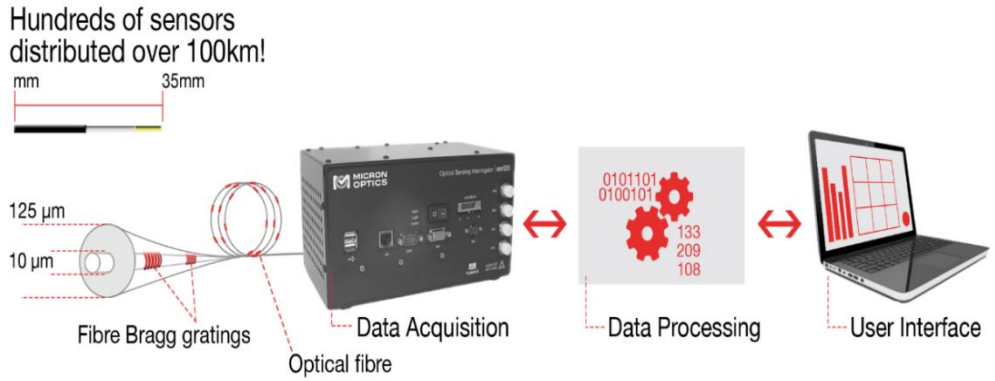
$200M+

Collective Valuation

How can High Energy Physics optimize irrigation systems?



The objective is to produce a low-cost Fiber Optics Sensors System for irrigation allowing farmers to carry out online monitoring of water presence in soil as well as other chemicals and pesticides



The problem

Global/Environmental

Water Scarcity

Water Contamination

Commercial

Expensive solutions

Practical Solutions

THE PROBLEM

Partnership

UK LEBANON TECH HUB

optoXsmart
OPTOELECTRONIC AND SMART SYSTEMS

FOSS for I

Fibre Optics Sensor
Systems for Irrigation

What are the advantages of partnerships?

- Knowledge Sharing/Transfer
- Access to people
- Innovation
- Reputation and credibility
- Exposure/Opportunities

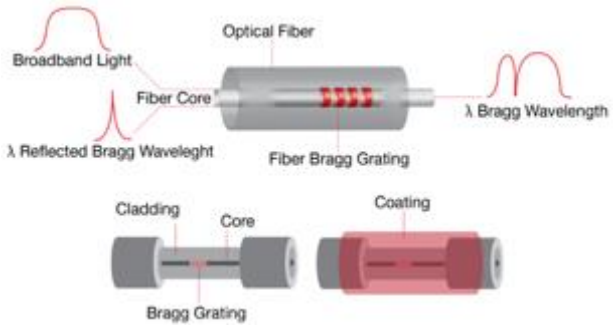
Timeline

5 Phases over 3 years

- Phase 0: Lab tests at UniSannio
- Phase 1: Limited scale field tests
- Phase 2: Large scale field tests
- Phase 3: Design of dedicated instrumentation and feasibility studies for SmartFiber
- Phase 4: Design of SmartFiber. Range of measured parameters including Temperature, Humidity, N2, fertiliser content, presence of special molecules such as pesticides or enzymes.

The Technology

Based on Fibre Bragg Grating (FBG) humidity sensors



The goal of the FBG technology is to engrave a periodic variation of refractive index into the core of a fibre, creating a series of reflectors. The resulting Fiber Optics Sensor will reflect particular wavelengths and transmit others. Using an infrared laser, a broadband light pulse is injected into the fibre. **The reflected light or Bragg wavelength is affected by the parameter the fibre has been designed to measure.** When the fibre is exposed to a variation in temperature, for example, the reflected wavelength will shift proportionally to the longitudinal dilatation of the reflectors, allowing a very precise measurement. By coating the FBG sensor with a functional material, the scope of the measurement can be changed to other applications such as humidity. For humidity sensors the coating is made using an hygroscopic material that translates the humidity into an elastic longitudinal deformation of the FBG sensor.

*Publication: A Comparative Study of Radiation-Tolerant Fiber Optic Sensors for Relative Humidity Monitoring in High-Radiation Environments at CERN, **IEEE Photonics Journal**, 6 (6), art. no. 6909002 (2014);*

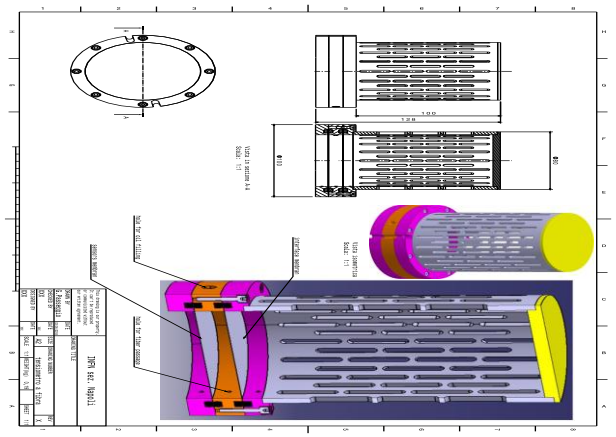
From Lab Testing to Field Testing

Sensors 1.0

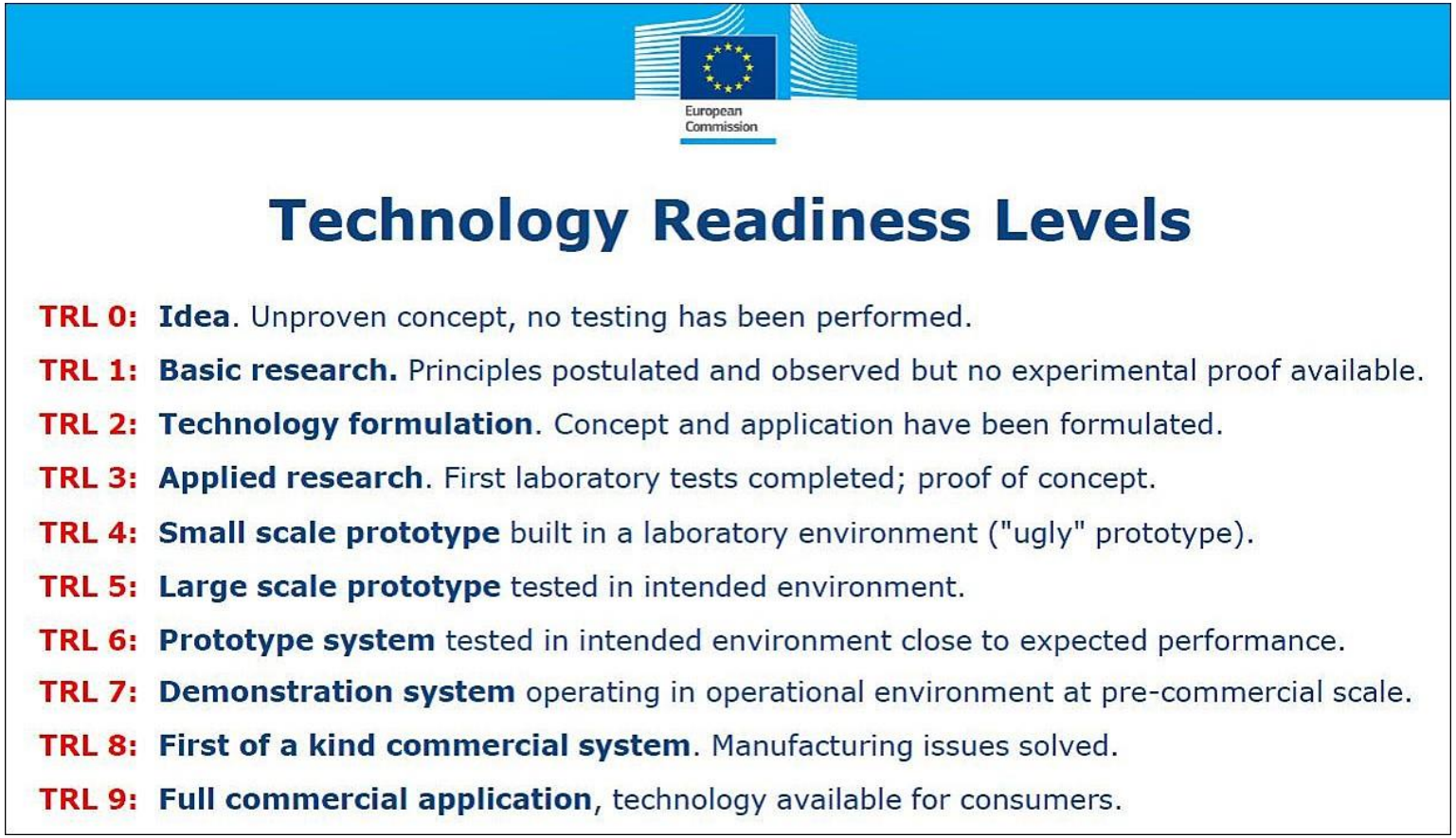
- Soil from Lebanon 55% clay
- Volumetric Water content
- All humidity sensors remain saturated

Sensors 1.1

- Exchange Surface
- No saturation
- Testing phase

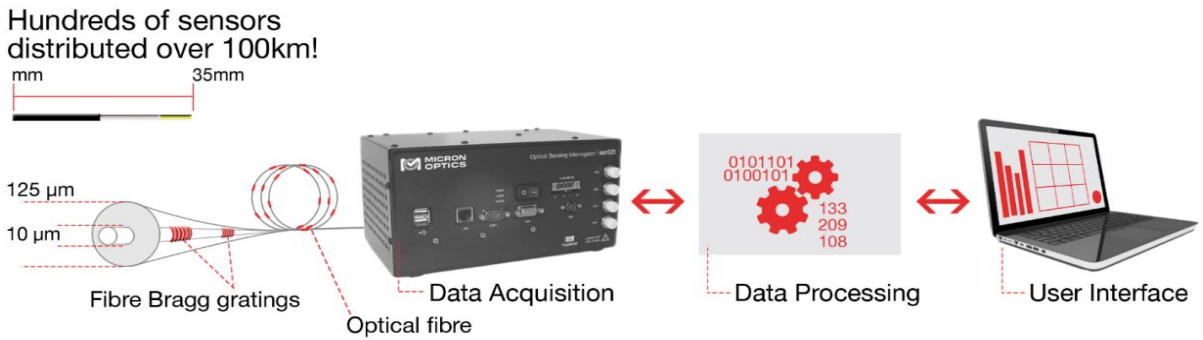


Technology Readiness Level



Project Scope – Phase 3

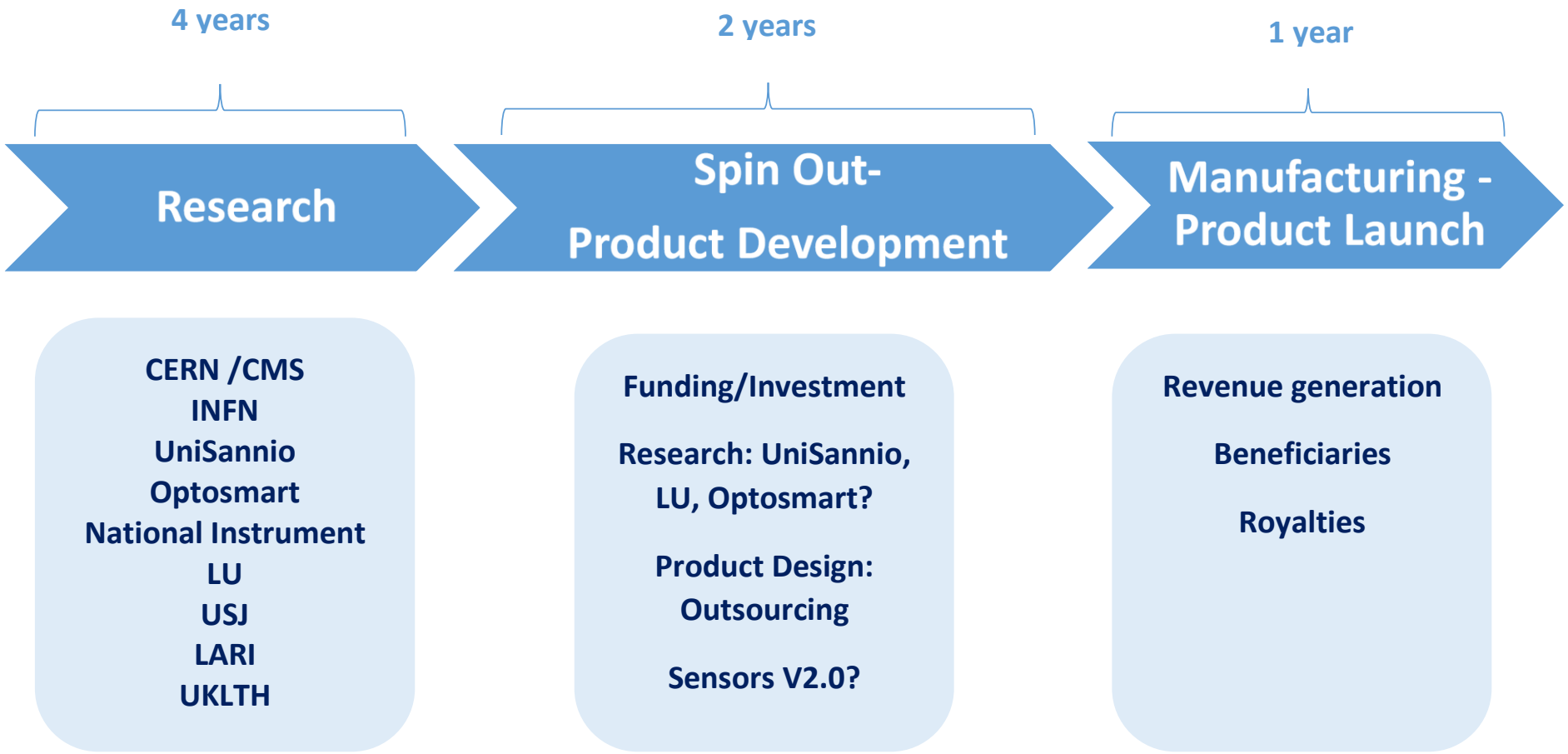
Price?



Value Proposition

- Large field scale testing/Remote areas
- No power is needed
- All in 1 sensor (including pesticides, chemicals and fertilizers)
- Low cost
- Various applications

Vision


4 years
2 years
1 year
Research
Spin Out-
Product Development
Manufacturing -
Product Launch
CERN /CMS
INFN
UniSannio
Optosmart
National Instrument
LU
USJ
LARI
UKLTH
Funding/Investment
Research: UniSannio, LU, Optosmart?
Product Design: Outsourcing
Sensors V2.0?
Revenue generation
Beneficiaries
Royalties

Potential – now and in the future

- Wood industry
- Agrometeorology
- Green houses
- Golf course
- Ecology/Environment
- Space farming
- Inert material (substrates)

Intellectual Property

- The owner(s) of the results may files a patent protecting the idea and technology. As long as the project run the patent remains a protection. When the project ends, the patent like all other IP “goes into OHL”

- The Parties shall make available their Results that are hardware under the CERN Open Hardware Licence v.1.2. Within two years of termination of the Project, the Parties shall make available their Results that are software under open source licence conditions under an OSI-approved licence

- The spin off in the meantime has developed a V1.5 sensor that is on the market. This version can be protected by another patent to protect the IP which is not generated within the FOSS4I project but by the spinoff itself

QUESTIONS?

THANK YOU!

For more info visit:

http://irc.uklebhub.com/foss4i

www.uklebhub.com

Email:
Elie.akhrass@uklebhub.com
martin.gastal@cern.ch