

Light & Complex Media

- 1) Mission
- 2) Knowledge
- 3) Assets
- 4) Examples of applications





Photo





Target customer: R&D labs Products involving "complex media" Mixes, suspensions, emulsions, fibers, powders, foams, pastes, gels, ...







Complex media

MACRO







Solutions Examples





2) Knowledge



Light matter interaction



- Wavelength : spectrometry
- **Photometry** : albedo, colours
 - **Position** on surface : imaging or scan
 - Angles : goniometry
 - Polarisation
 - Phase (interferometry)

Light offers many ways to explore a complex material







Static light scattering...

Study of the geometry of the photons trajectories.







Mie is powerfull...





Microstructure

Invisible but strongly deviates light

Visible deviates poorly light

λ

Strong interaction light/µstructure IF Object size ≈λ Drops, pigments, fibers, bubbles, cells, etc ...



Fibers



Emulsions



Foams







► Particule size

Bio cells



Multiple scattering





Transport length 1*

After x scattering: **Random Motion**

l* (transport length)

(or the inverse: reduced scattering coefficient μ_s ')







Dynamic scattering:

Diffusing Wave Spectroscopy DWS

Dynamic scattering: Diffusing Wave Spectroscopy (DWS)

Laser light-> moving interferences





See http://photonlyx.com/papers/DWS/dws.html

Dynamic Light Scattering

Video: multiple scattering of a coherent photon

www.youtube.com/watch?v=88jJBCnzPIk



Autocorrelation: the tool to measure speckle dynamics





(See blog photonlyx.com)





Photo



The team

The founder has a large experience in scientific instrumentation

- Education at Institut d'Optique Graduate School (Paris) •
- **CERN** (proposed and designed the Muon Barrel Position Monitor of the CMS experiment of ٠ LHC)
- **CNRS** (with P. Snabre, colloids, particles in fluid dynamics) •
- Formulaction (Toulouse, Scientific Instruments Design for stability ; drying and micro-• rheology applications)



Designing the Future Circular Collider (teaser)

https://videos.cern.ch/record/2653671

- 4 patents 26 articles, chapters and conference papers

Physics simulations



Software package



We provide a direct way from experiment to prototype with software modules ready to integrate and rapidly debugged in a final APP.

- User interface
- Signal/image processingPhysics models

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Tailored design Fast prototyping



PhotonLyX offers a complete package :

- Physics (models) and optical engineering
- Design of prototypes instruments
- Numerical simulation

FabLab Santander





PhotonLyX owns a FabLab in Santander downtown

PhotonLyX is up to date in fast prototyping process, 3D design, 3D printing, laser engraving etc...

Connexion with a large « makers » community

4) Examples of applications



Drying, gelation, ageing,...







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Micro-rheology



Micro-rheology



Laser

Phote

Speckle dynamics

Particles dynamics



Product viscosity & elasticity

Connected blue light sensor

- -- ------







Microscanner based on « shape from shading »

Scan of skin molds:



https://youtu.be/GAnKRDaNaOY









Milk analysis



Fat and protein analysis Potential for low cost instrument.

Foam dynamics and bubbles physico-chemical analysis







Diffuse Optical Tomography



Cut XY





3D view



Surface scan of soft material layer





Skin analysis



Photo



Sensations

PhotonLyX connects human sensations with physics measurements :

Visual perception (cosmetics)



Tactile sensation (leather)

